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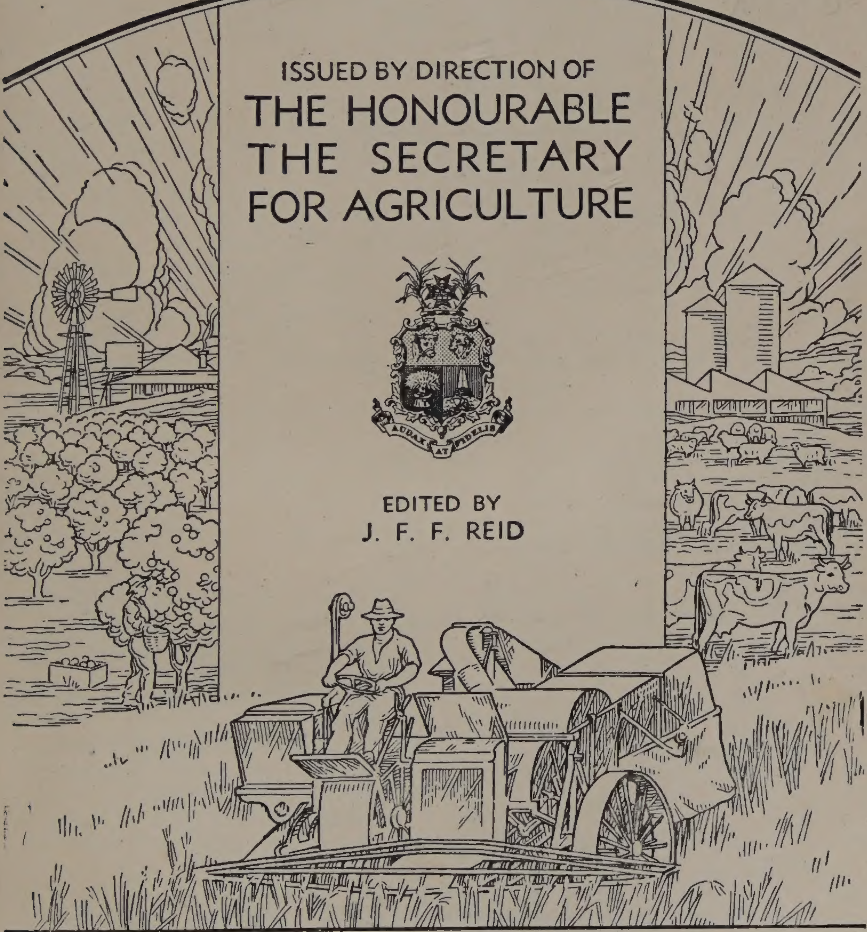

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Event and Comment

Water Conservation and Irrigation—Development of State Resources.

THREE inland streams—the Condamine, Macintyre Brook, and Barambah Creek—have been recommended to the Government by the Rural Development Bureau for survey as to their water storage possibilities, and the Premier (Hon. W. Forgan Smith, LL.D.) has announced that the Government has authorised the Co-ordinator-General (Mr. Kemp) to co-operate with the Irrigation Branch of the Lands Department in having the engineering and other detailed investigational work done. Actual developmental and constructional work will depend mainly on the results of preliminary surveys and the availability of funds. Side by side with the engineering investigations, expert departmental inquiries into the possible effects of irrigation on production within the area to be served have been arranged.

Previous preliminary surveys have been made on the Condamine River—the last in 1920, when a continuous survey had been undertaken on the section from above Killarney to a point about 14 miles south from Goombi, near Miles. At present, some irrigation is carried on from the river under a system of licensed pumping, but there is apparently scope for much better utilisation of the river's resources. It is hoped that the development of sound irrigation schemes on this stream will be of benefit to agriculture, and will be an important step in the fostering of the meat export industry.

The Macintyre Brook traverses good agricultural and farming land suitable for a variety of purposes, including tobacco and cotton growing. The area is not yet fully productive, mainly because of periods of dryness. Irrigation done at present with the limited water available has given great promise in tobacco and lucerne cultivation. With the approval of the Government, certain investigational work has already been undertaken in the area by the Irrigation Branch.

Preliminary investigations into the possibilities of water conservation in Barambah Creek for irrigation and town and stock route supplies in the South Burnett show definite possibilities of economic water utilisation on a considerable scale. Certain smaller group water schemes also are under consideration, but definite recommendations have not yet been submitted to the Government.

Discussing rural developmental plans for the coming financial year, the Premier said that the meat export industry, particularly chilled beef, appeared to be one of the directions in which there were good possibilities of expansion on sound economic lines. Continuity of supplies of suitable cattle was one of the essential factors, but the difficulties in ensuring continuity were great.

The "lean" period seemed to be between the end of winter and the end of the year, and this was therefore the time during which the efforts of man should supplement the workings of Nature. The Government was anxious to enlist the assistance of smaller producers in stabilising supplies of suitable "killers."

Growing and conserving of fodders would help to secure stability, and water storage and irrigation would aid in the growing of suitable fodders for "topping-off" and conservation.

The Government recognised, however, that water schemes for these producers would be more likely to succeed, and certainly would be more generally useful, if they covered a range of purposes, such as beef production, fat lamb raising, pig raising, dairying, wheat, cotton, and tobacco growing, or a combination of two or more of these units or of other allied units. The supplying of water for domestic purposes, also, was an important consideration.

A committee of experts had reviewed various "prospects" before recommending the first three streams for investigation, with due regard to the objectives which the Government had in mind.

The Government had approved the recommendation of the Co-ordinator-General that a co-ordinated water scheme for the South Coast should be investigated. For some time the Southport, Nerang, and Coolangatta Councils had been endeavouring, jointly and severally, to obtain Government assistance to finance water and sewerage schemes in the area.

Mr. Kemp thinks that it may be possible to evolve a co-ordinated scheme, but present individual schemes may have been developed to such an extent that it would be uneconomic to undertake a joint scheme. As the beginning of a complete investigation, he would convene an early conference of the councils and the Irrigation Branch.

It is proposed to establish an irrigation plant at the Agricultural Research Station, Biloela, to correlate investigation in the irrigation

of cotton with the routine cotton work conducted at the station. Investigations also are being made into the adequacy of available water supplies at Biloela.

It also is intended to establish small irrigation plants on approved farms in likely cotton-growing areas, to test the effects of irrigation on cotton-growing. These experiments will be controlled by the Department of Agriculture and Stock.

It has been recognised that the water supply at Townsville is deficient for a city of that size. The matter of remedying this deficiency has been brought under notice again recently by the Townsville City Council, and the Government has now approved Mr. Kemp's recommendation that the possibility of a sound scheme should be investigated.

Quality of Queensland Butter.

IN opening the Annual Butter and Cheese Exhibition arranged by the Australian Institute of Dairy Factory Managers and Secretaries (Queensland Branch), at the Hamilton Cold Stores, the Assistant Minister for Agriculture and Stock, Hon. D. A. Gledson, said that he was very concerned with the great disparity shown in the butter gradings from year to year. In some years there was a drop of 20 per cent. in the gradings, and he quoted the comparative figures for 1934-35, 1935-36, 1936-37, 1937-38, and for the first eleven months of 1938-39; and also the figures for May, 1939, separately. On looking at this grading, it appeared that seasonal conditions had a great deal to do with the quality of butter. In addition to pasturage—which was affected by weather conditions, and other matters, such as temperature—not only the handling of cream, but the transport of the butter itself, had much to do with quality. All these factors in dairying, where capable of improvement, demanded close study, and an endeavour should be made to eliminate any of the causes of lowered quality.

The factory managers and secretaries who had gathered in conference, Mr. Gledson added, were to be complimented on the splendid show which had been arranged. The show provided excellent bases for comparison, and the remarks of the judges on the quality of butter and cheese displayed were of obvious educational value. It had been pointed out by the experts that the manufacture of the butter had a marked influence on grading. If manufacturing standards were maintained at a high level, quality should, at this time of the year particularly, be assured. If, however, through defective machinery or through any fault in manufacturing processes the texture of the butter was not what it should be, then obviously the quality of the product would not be up to the standard desired. Many of the butters examined showed that in manufacture there was very little to choose between each of the exhibits, the difference in most cases being the flavour. The different classes of butter, salted and unsalted, coloureds and whites, had all attained a very high standard and were creditable to all concerned. Mr. Gledson congratulated the winners of the competition on the excellent display of dairy products, and the business-like way in which they had been prepared for market, both for home consumption and for export trade. The matter of still further improvement was one which would have to be dealt with not only by the factory managers, but by the Department of Agriculture and Stock as well, and in co-operation they should be able to attain and maintain the highest standard possible.

Parasites of Poultry.

F. H. S. ROBERTS, D.Sc., Animal Health Station, Yeerongpilly.

POULTRY in Queensland are subject to many diseases, among which those caused by parasites are undoubtedly the most prevalent. There are many different kinds of parasites which infest poultry. Certain species of ticks, lice, mites, and fleas occur on the surface of the body (external parasites), whilst the internal organs, particularly the alimentary canal, are infested by worms (internal parasites).

Parasites are harmful in many ways. The external parasites suck blood and cause irritation and annoyance. The worms rob the host of food, destroy vital tissues, and excrete substances which are poisons. The result of infestation is an unthrifty flock, which shows loss of condition, a decreased egg production, and frequently increased food bills. Furthermore, parasites so lower the vitality of a flock as to make it readily susceptible to other diseases. Unlike many diseases, which break out in epidemic form and then disappear, parasitic diseases are present all the time, working in an insidious sort of way, gradually sapping the strength of the birds, killing an occasional bird, and in many instances, the factor deciding between profit and loss.

It is therefore essential that the poultry farmer should know something of the various parasites which infest his birds; how the birds become infested; what steps to take to prevent losses caused by them, and so on. Without this knowledge he cannot hope to keep his flocks in a healthy condition.

THE WORM PARASITES.

With the exception of the eye worm, worm parasites of poultry in Queensland are found only in the alimentary canal, which is another name for the gullet, crop, stomach, gizzard, intestine, and cæca or blind gut, all of which may be infested.

HOW TO DETERMINE WHETHER WORMS ARE AFFECTING THE HEALTH OF THE FLOCK.

As a matter of routine, the farmer should examine every bird that dies or is killed. It is only in this way that he can keep a check on the degree to which his birds harbour parasites. If parasites are suspected of being responsible for any loss of bloom or condition or for any decrease in production, much can be learned from an examination of birds from the affected flock. It is always wise to examine at least two birds. The bird is opened up by a cut in the region of the vent and on each side of the breast bone. This is then pulled back displaying the intestines, &c. These are carefully removed, and the intestines freed from the webbing that holds them. Each section is then slit open and washed. The stomach is examined for stomach worms which, if present, will be seen with their anterior ends buried in the stomach wall. If there are any dark patches on the horny lining of the gizzard, the lining should be stripped off and the worms will be visible, protruding from the wall of the gizzard. In the case of the intestines, these should be slit open in a bucket of water and drawn several times between the thumb and forefinger to remove as much mucus as possible. This is necessary because many small species lie entangled in the mucus. The

washings are allowed to settle and the fluid carefully poured off. This is done two or three times until the water remains clear. The washings are next examined in a glass dish held over a black background. It is only in this way that the small worms can be detected and that some idea of the number of worms present can be obtained.

In coming to a decision, the following points should be borne in mind:—

(1) Few worms do little harm and it is only when they are present in numbers that the birds' health becomes affected. It would be rather unusual to examine any bird and not find some worms, and it is too often the case that when the farmer sees a few worms in the bird he is examining, particularly such large species as the large roundworm, that he concludes that worms are responsible for the poor condition of his flock.

(2) When worms are definitely affecting the health of a bird, the tissues in which they live are generally unhealthy in appearance. The intestine wall, for example, may show various degrees of inflammation. There may also be hæmorrhages, &c.

(3) There should be some marked relationship between the number of worms present and the symptoms of ill-health displayed by the birds. Unfortunately, there are no symptoms which are characteristic of worm infestation alone, and this point is frequently a very difficult one to decide, even for the trained parasitologist.

(4) Finally, it is essential that other disease conditions be taken into consideration as possibly being responsible. It is by no means uncommon to find birds suffering from such debilitating diseases as tuberculosis to be heavily infested. The removal of the worms by treatment will do little good, for this does not eliminate the real cause of ill-health.

CONTROL OF WORM PARASITES.

In order to appreciate the principles advocated in the control of worm parasites, the farmer should be familiar with the manner by which birds become infested.

LIFE HISTORY OF WORM PARASITES (Plate 1).

Worms do not propagate inside the host, and the only way in which birds can become infested is by swallowing infective material. The female worm in the alimentary canal of the bird lays eggs which eventually reach the exterior in the droppings. Depending upon the species of worm, infestation then takes place in either one of two ways.

(1) The egg of the worm as it lies in the droppings undergoes certain development, providing conditions of temperature and moisture are suitable. After several days, a tiny larval worm is formed in the egg. In the case of such species as the large roundworm and caecum worm, when an egg containing such a larva is swallowed by a bird, it hatches in the intestine, the larva is set free and migrating to that portion of the alimentary canal it favours, settles down and grows to the adult stage. With other species, the egg hatches outside the bird, and the larva grows and reaches what is known as the infective stage when, if swallowed by the bird, it grows to maturity.

(2) Other species again require what is known as an intermediate host to complete their development. The egg is swallowed by this intermediate host in which it reaches the infective stage. When the intermediate host is eaten by a bird, the larva is set free and grows to the adult stage. This type of life history is characteristic of all tapeworms and flukes, and in the case of those species infesting poultry, the intermediate hosts include slugs, snails, bettles, ants, and flies. Each species of tapeworm, of course, has its own particular kind of intermediate host or hosts. The stomach worm, gizzard worm, and eye worm of poultry also require an intermediate host, in this case wood lice, grasshoppers, beetles, and cockroaches being concerned.

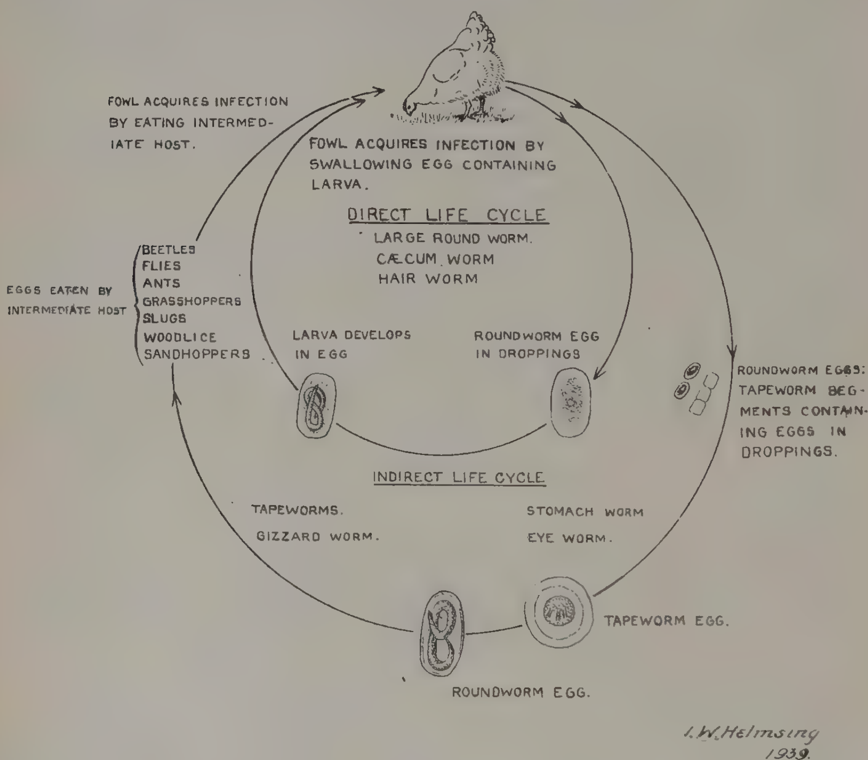

Plate 1.

HOW BIRDS BECOME INFESTED WITH WORMS.

1. Birds in contact with droppings.
2. Earth floors in houses.
3. Damp areas in yards and pastures.
4. Litter, long weeds in yards and pastures.
5. Heavy stocking.
6. Permanent yards and pastures.
7. Young birds run with old birds.
8. Poor feeding.

CONTROL.

Worm diseases of poultry may be controlled, firstly by putting into operation certain measures which prevent infestation, and secondly by the treatment of infested birds.

Preventive Measures.—It is practically impossible to keep birds entirely free from worms, but much can be done to prevent them from becoming so heavily infested that their health is affected. The above

notes on the life history of worm parasites show very clearly that preventive measures must take into account, firstly, the droppings which contain the worm eggs, secondly, conditions which favour the development of the eggs, and thirdly, the various insects which act as intermediate hosts. With these points in mind, the following principles may be laid down:—

(1) Poultry houses should be built on well-drained sunny sites, and should be provided with floors which permit thorough removal of all droppings. This cannot be done on earthen floors.

(2) Droppings should be removed regularly and disposed of in such a way that they are not available to the birds or to the insects and other intermediate hosts which feed on them. Birds can be protected from their own droppings to a large extent by fastening a length of small gauze wire netting beneath the roosts.

(3) Keep the yards and surroundings as clean and tidy as possible. Loose boards, piles of sacking, old coops, heaps of vegetation, &c., provide shelter for the insects, &c., that act as intermediate hosts.

(4) Keep the yards as bare as possible. This permits the sunlight to destroy worm eggs and promotes dry conditions which are unfavourable to the development of the eggs. Yards should be selected on light types of soil which give good drainage.

(5) Rotate the yards, and where this is not possible remove the top few inches of soil periodically and replace with fresh, clean soil.

(6) Keep the food troughs and drinking vessels clean, and eliminate all damp areas. This applies particularly to the soil around drinking fountains.

(7) For birds on free range, keep the vegetation short. Long grass and weeds encourage the presence of insect intermediate hosts and also provide ideal conditions for the development of worm eggs. Such pastures should be periodically ploughed under to bury the eggs.

(8) On free range and in yards where the collection of droppings is not possible, stock lightly. The more birds there are on a given area of land, the more eggs are present and the greater the risk of infection. It has been estimated that the chances of infestation on a given area of land increase as the square of the number of birds running there.

(9) Young birds are much more susceptible to parasites than old birds. These should then be raised, isolated from old birds and from the runs and houses used by old birds.

(10) Kill off and destroy all weak or obviously diseased birds, as these generally carry large numbers of worms and are a source of infection for the rest of the flock.

(11) Feed an adequate, well-balanced ration. It is well known that birds adequately nourished harbour less worms and are less affected than birds on a poor diet. This is a very important point in poultry parasite control.

Undoubtedly the intensive system is much to be preferred from the preventive point of view to the free range system, for under the intensive system, droppings can be regularly collected, and the birds do not come into contact with the insect intermediate hosts to the extent they do on free range. In warm climates, such as North Queensland, birds

could be maintained on wire mesh floors, which permits the droppings to fall through to the ground beneath. Electrically welded rectangular mesh wire is suitable as this type does not injure the birds' feet.

Treatment.—The progressive farmer should never rely solely on treatment to keep his flocks worm free. So long as no attempt is made to prevent infestation, treatment gives only a temporary measure of relief. The importance of prevention, furthermore, is emphasised by the present unsatisfactory position of treatment. Of the many worms infesting poultry, we know of treatment being reliable against only one species, namely, the large roundworm. In inexperienced hands treatment may also do more harm than good.

The control of poultry parasites rests mainly upon prevention, of which sanitation, hygiene, and proper feeding are the essential features.

There are three different kinds of parasitic worms, namely, flukes, tapeworms, and roundworms.

FLUKES.

Flukes are generally flattened and leaf-like. They are characterised by the possession of suckers, usually two, and as a rule, are hermaphrodite, that is, each fluke contains a complete set of male and female genital organs. They are spread by means of snails, though some species require a second intermediate host to complete their development.

Flukes are serious in poultry in many parts of the world, particularly the species inhabitating the oviducts, which uses snails and dragonflies as intermediate hosts. In Queensland, only one species is known, the caecal fluke, *Echinostomum revolutum*, which is most common in ducks. It does not, however, appear to be very harmful.

TAPEWORMS.

These are elongate flattened whitish worms, which are found in the intestine. At the anterior end is a small head which is provided with suckers and sometimes hooks. This is followed generally by a slender neck, which gradually gives place to a chain of segments which become progressively wider towards the posterior end of the worm. Each segment contains a complete set of male and female organs. The tapeworm has no mouth or intestine, its food being absorbed through the body surface.

Life History.

The segments at the posterior end contain the ripe eggs. These drop off and are passed out with the droppings. They have the appearance of rice grains and may be very active for a short time after reaching the ground. The eggs have then to be swallowed by certain species of insects, such as beetles, ants, house-flies, or slugs, before further development occurs, each species of tapeworm having its own special intermediate host or hosts. The bird becomes infested when it eats those insects or slugs containing the tapeworm larvæ.

Description of the Various Species (Plate 2).

Seven different species of tapeworms are known to infest poultry in this State.

The smallest of these is *Davainea proglottina*, which measures at most only about one-tenth of an inch long. It is found in the anterior

part of the small intestine. This part of the intestine is also infested by a very slender species of *Hymenolepis* which measures about $\frac{1}{2}$ inch to 2 inches in length, and also by a much stouter and longer species, *Raillietina cesticillus.* In the lower portion of the small intestine, two very long species may be seen, *Raillietina tetragona* and *Raillietina echinobothrida,* which grow up to 10 inches in length. The remaining species, *Amoebotaenia sphenoides,* is very small in size and is very rare.

Effect on the Fowl.

The most serious tapeworm is *D. proglottina,* which, despite its small size, is capable when in sufficient numbers, of giving rise to very marked symptoms. Diarrhoea frequently containing blood is conspicuous and death, especially among young birds, is not uncommon. *R. cesticillus*

Plate 2.
THE DIFFERENT KINDS OF TAPEWORMS FOUND IN THE FOWL (NATURAL SIZE).

has a marked effect upon the growth of young chickens and in young birds an infestation of fifteen or more worms may be regarded as serious. *R. echinobothrida* is responsible for the formation of nodules in the gut wall, caused from injuries to the tissues by the heads of the worms *R. tetragona,* which is our commonest species, is considered to be very harmful in some countries, but observations in Queensland do not support this view. Frequently one sees heavy infestations of *Hymenolepis* spp. accompanied by inflammation of the intestine and diarrhoea.

In general, it may be said that tapeworms are more injurious to young birds than to old birds. In the case of old birds, they probably become harmful, chiefly when other disease conditions are present, which they tend to aggravate. The symptoms associated with tapeworm disease are unthriftiness, loss of condition, pale combs and shanks, diarrhoea, decreased egg production, and occasionally death.

Treatment and Control.

The frequency with which segments appear in the droppings, together with a consideration of the condition of the flock, is a fairly reliable indication of the degree of infestation.

Treatment is not very satisfactory. Kamala is usually recommended in doses of one gram for adult birds. It fails, however, to remove the heads of the worms, which grow again shortly afterwards. It also has the serious disadvantage of affecting production. On occasions, moreover, its use may be followed by more serious ill-effects. When using this drug it is always wise to treat a few birds first and watch them closely. Kamala is not recommended for turkeys.

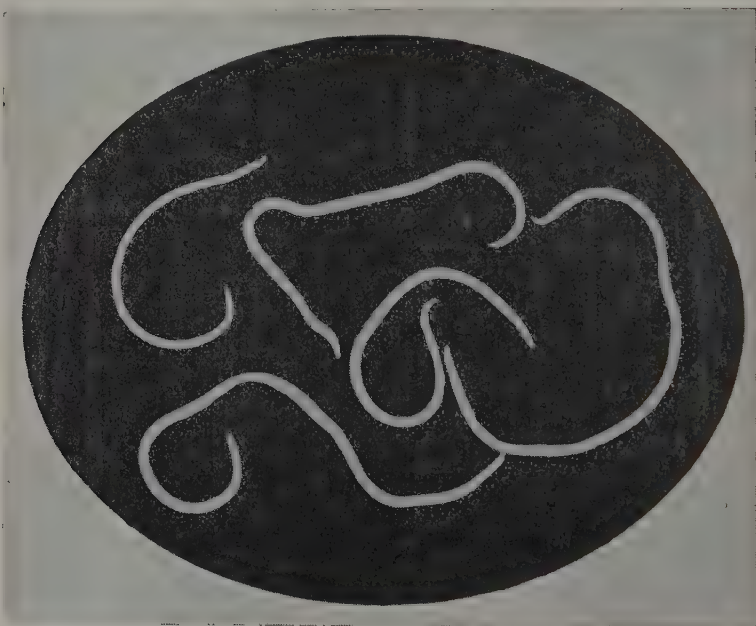

Plate 3.
THE LARGE ROUNDWORM (NATURAL SIZE).

Prevention of infestation is, therefore, highly important in the case of tapeworms. The principles outlined earlier in this article should be followed as rigidly as practicable.

In the case of *D. proglottina,* the slug intermediate host can be eradicated by the use of the following poison bait:—

*Metaldehyde ¼ oz. (1 tablet).

Bran 8 oz.

The methaldehyde blocks are ground up and mixed with the bran. Water is added in sufficient quantities to moisten. The bait is then applied in the form of small pellets, about the size of a walnut. This bait is non-poisonous to poultry.

* This substance is sold under the name "Meta." It is insoluble in water and is used as a fuel.

ROUNDWORMS.

These are elongate cylindrical worms. Roundworms vary greatly in size, and in poultry may attain a length of nearly five inches. In the majority of roundworms the life cycle is direct, that is the host becomes infested when it swallows an egg or larva which is in the infective stage. Some species, however, require an intermediate host to complete their life cycle, in much the same way as tapeworms.

THE LARGE ROUNDWORM (Ascaridia galli) (Plate 3).

This is one of the commonest species infesting poultry. It is whitish in colour, and may grow up to nearly five inches in length. It is found in the intestine.

Plate 4.
YOUNG BIRD HEAVILY INFESTED WITH THE LARGE ROUNDWORM.

Life History.

The egg is passed out of the body in the droppings. In eight days, under suitable conditions of temperature and moisture, a tiny larva develops within the egg. On being swallowed by poultry, the egg hatches in the intestine and the larva is set free. Here it remains for about nine to ten days, and then invades the intestine wall, where it may be seen with its anterior end buried into the tissues. After feeding on the tissues for about nine to ten days, the young worm returns to the canal of the intestine where it grows to maturity, which is reached about one month after infection.

Effect on the Fowl.

The large roundworm is most serious among young birds. Among these, symptoms may be visible within the first week of coming into contact with infested soil. There may be loss of appetite, abnormal thirst, and the birds are disinclined to move about. Later on, diarrhoea and paleness in the comb and shanks may be seen. Eventually, the feathers become ruffled, the wings droop, and the bird assumes a hunched up, drowsy appearance. (Plate 4.) There is little growth; in fact, infested birds may lose weight. Death may occur at this stage, but should the bird recover it remains stunted, despite a voracious appetite.

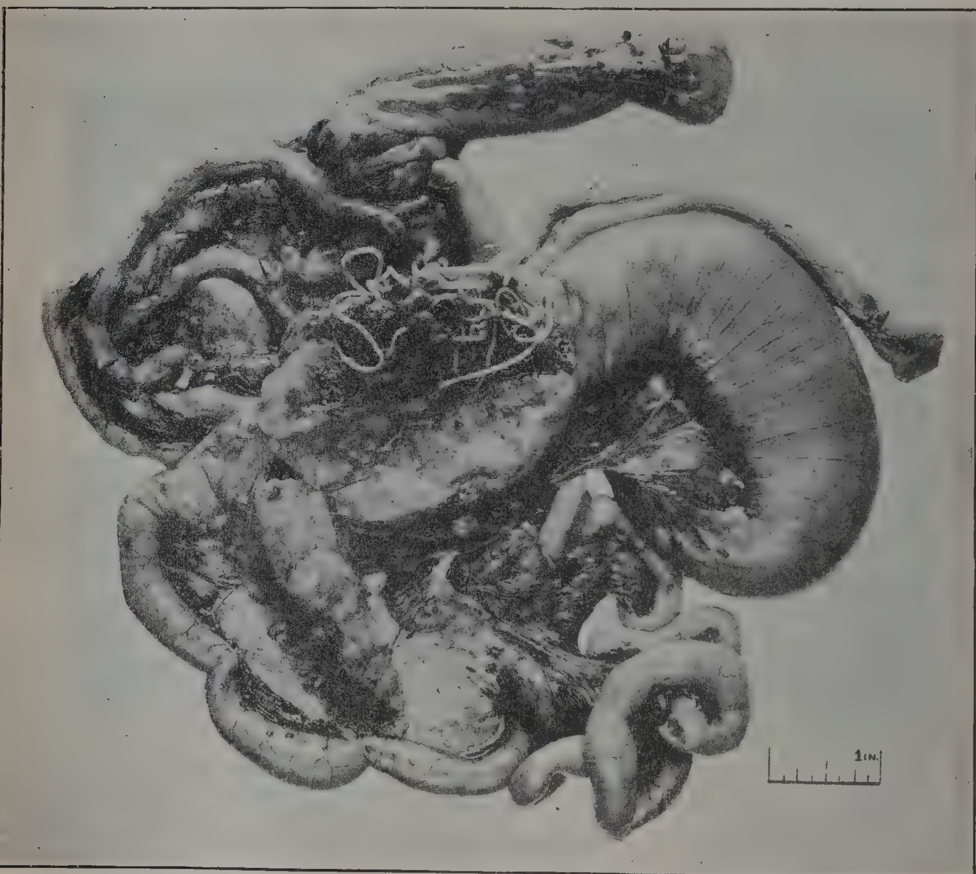

Plate 5.

RUPTURE OF INTESTINE CAUSED BY BLOCKAGE BY ENTANGLED MASS OF WORMS.

In older birds a heavy infestation is denoted by pale combs and legs, dull plumage, loss of condition, increased food consumption, and loss in production. Unless other disease conditions intervene deaths among old birds are much less common than among young birds. Sometimes, the worms become entangled together, completely blocking the passage of food, as a result of which death may occur through a rupture of the intestine wall. (Plate 5.)

Treatment and Control.

Experimental work has indicated that, for birds on an adequate ration, twenty-five worms or more may be regarded as definitely harmful to young birds, and fifty worms or more as harmful to older birds. If the ration is inadequate or badly balanced, the number of worms to be regarded as serious would, of course, be smaller than these figures. Occasionally, young birds may be severely affected, and yet on casual examination, no or few large worms are to be seen. If the intestine is carefully searched under water, however, numerous small worms will be seen, many of them feeding on the tissues of the intestine wall.

Treatment.—Where indicated, treatment for the removal of this species can be successfully applied. There are two methods available, namely, individual treatment and flock treatment.

Individual Treatment.—By this method each bird in the flock is caught and treated. Although objected to by many farmers as laborious and interfering too much with the birds, individual treatment is the only way by which one can be sure that each bird has been treated, and has received no more and no less than the recommended dose of the vermifuge. There is no doubt of the greater efficiency given by this type of treatment.

Best results will be obtained from carbontetrachloride. The drug is given first thing in the morning after overnight starvation. The following doses are recommended:—

Birds, six months and older, 2 cubic centimetres.

Birds, four to six months, 1½ cubic centimetres.

Birds, two to four months, 1 cubic centimetre.

Birds, under two months, ½ to ¾ cubic centimetre.

The drug may be given in capsules, in which form it may be purchased. When giving a capsule to a bird, first dip the capsule in water, take it between the thumb and forefinger and insert it far back into the bird's throat, taking care not to break it or insert it into the wind pipe. Then push it down with the forefinger and work it down the gullet into the crop by manipulating it with the thumb and forefinger from the outside of the throat.

Capsules, however, are very expensive, and a much cheaper method is to administer the drug by means of a syringe and a piece of rubber tubing. A graduated glass barrelled 5 cubic centimetre or 10 cubic centimetre syringe, and a piece of No. 5 gauge rubber tubing about 6 inches long are required. Open the bird's mouth and insert the rubber tubing into the throat and well down into the gullet, *taking care the tubing does not enter the windpipe.* If the drug accidentally enters the lungs, the bird will die. Fill the syringe with the drug, attach it to the tubing and administer the recommended dose. Detach the syringe, wait a moment or two, then pull out the tubing. This last step is advised, because sometimes if the tubing is pulled out still attached to the syringe, there may still be some carbontetrachloride left in the tubing, which may enter the windpipe and cause death.

If carefully carried out this treatment with carbontetrachloride will remove practically every worm. It is, furthermore, extremely safe and will not affect production.

Flock Treatment.—By this method the entire flock is treated at the one time by providing a mash with which the vermifuge is mixed. This method fails to take into account the different food consumptions of the individuals of a flock and consequently those birds with small appetites do not receive as much of the vermifuge as birds with a normal or voracious appetite. As this factor frequently applies to very wormy birds, it is a serious disadvantage to this type of treatment.

Tobacco dust is recommended as a flock treatment in the United States, the prepared mash containing 2 per cent. tobacco dust. The tobacco dust, however, must contain 2 per cent. nicotine, and as it is very difficult to secure a commercial tobacco dust in Australia containing more than 1 per cent. nicotine, this treatment cannot be expected to give good results here.

Recent experimental work at Yeerongpilly has shown, however, that by substituting nicotine sulphate for tobacco dust, a satisfactory treatment can be obtained. *Nicotine sulphate is highly poisonous, and every care should be taken when using it.* The sample used should be of good quality, and should contain 40 per cent. or thereabouts of nicotine. The drug is added to the mash at the rate of 0·5 cubic centimetres per lb. weight of dry mash. The amount of nicotine sulphate required should be accurately measured, and for this purpose a 5 or 10 cubic centimetre graduated glass cylinder should be procured.

The treatment is carried out in the following manner:—

For Birds Fed a Dry Mash.—It is best to prepare the treated mash separately for each pen. Estimate the amount of food consumed each day by the pens to be treated. An adult White Leghorn hen will consume from 3 oz. to 3½ oz. of dry mash each day, and an adult Australorp 3½ oz. to 4 oz. per day. If grain is fed, the amount of dry mash consumed will, of course, be less than the figures quoted above. Suppose there is a pen of twenty-five birds, and that these eat about 6 lb. of dry mash per day, then 3 cubic centimetres of nicotine sulphate will be required. The 3 cubic centimetres of nicotine sulphate is then diluted with not quite half a cupful of water, and *thoroughly* mixed in with ½ lb. of dry bran. The mixing is done with the hands. This prepared bran should be flaky, and is then thoroughly mixed with the 6 lb. of dry mash and fed. In this way each pen can be treated.

The treatment should be continued for a period of four to six days, the treated mash being prepared freshly each morning. For birds fed a dry mash only treatment for four days is ample, but if grain is also fed, a further two days treatment is desirable.

The prepared mash is by no means distasteful, and does not affect the birds in any way.

For Birds Fed a Wet Mash.—Nicotine sulphate is added to the mash at the rate of 1 cubic centimetre for every ten cupfuls (small) of water that are used to moisten the mash. This treated mash should be fed for about six days. Treatment by means of a wet mash is not very satisfactory, however, as the mash becomes distasteful to the birds. Those farmers who use a wet mash would be well advised to use carbon-tetrachloride for any treatment that is required.

The eggs of the large roundworm are thick shelled and very resistant to adverse conditions. Once the farm becomes infested with the eggs of this species, it remains so for a long time. Sanitation is, therefore, the most important measure of prevention.

It has been demonstrated that the older a bird becomes, the more difficult it is to infest, and the less the worms affect it. The critical age is up to about four months. Every effort should, therefore, be made to protect the young birds. They could be raised in concrete-floored pens, away from the older birds. Otherwise, they could be penned on new ground, or on ground on which poultry has not been running for at least a year.

Correct feeding is also very important. An adequate well-balanced diet will do much to reduce the losses associated with this species.

Plate 6.
STOMACH WORMS (NATURAL SIZE).

THE STOMACH WORM (Acuaria spiralis) (Plate 6).

This is a short, stout species, less than half an inch in length, which is found in the proventriculus or glandular stomach.

Life History.

The eggs, as usual are passed out in the droppings. Before further development can take place the eggs must be swallowed by a woodlouse, in which the larvae hatch, and eventually grow to the infective stage. When the fowl eats one of these infected woodlice, the larvae are set free in the stomach, where they settle down and grow to maturity.

Effect on the Fowl.

This worm is not very common in Queensland, but heavy infestations are sometimes seen. (Plate 7.) The worms invade the wall of the stomach, burying their anterior ends into the glands. The glands are destroyed and ulcers may be formed. This seriously interferes with digestion and infested birds, whilst maintaining a ravenous appetite, lose condition, grow weak, and may die.

Treatment and Control.

The treatment with carbontetrachloride as set out for the large roundworm is recommended.

Attention to sanitation and elimination of conditions encouraging the presence of woodlice are necessary to prevent infestation. Woodlice are very commonly found under litter, which provides the damp conditions which they favour. They measure about half an inch in length and are flat and slate-grey in colour. The body is composed of numerous segments each of which is provided with a pair of pale-coloured legs. Woodlice are not insects, but are related to the crabs, crayfish, and shrimps.

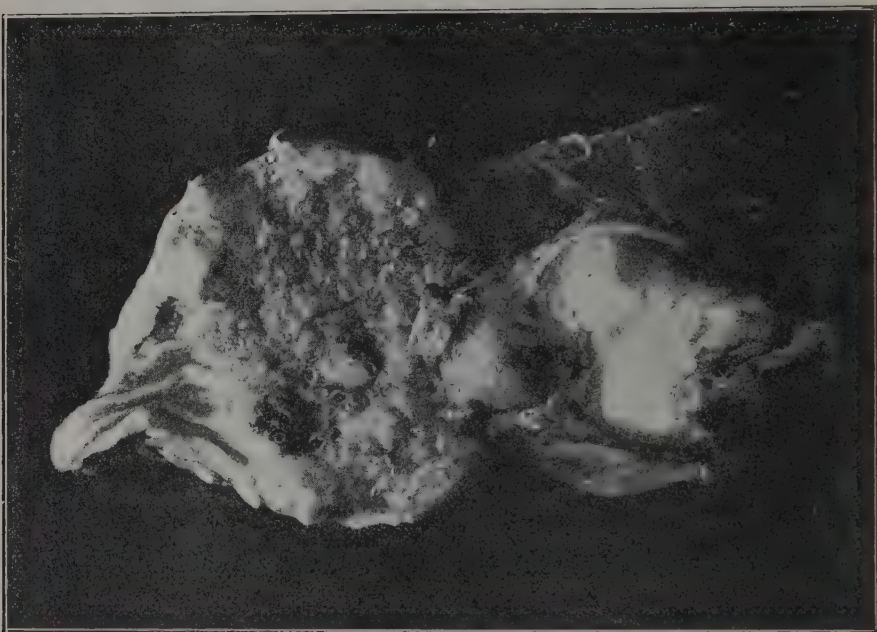

Plate 7.
STOMACH OF FOWL INFESTED WITH STOMACH WORMS.

THE GIZZARD WORM (Acuaria hamulosa) (Plate 8).

These are pinkish worms, measuring up to an inch and more in length, which are found in the walls of the gizzard.

Life Cycle.

The eggs of the gizzard worm also require an intermediate host, and in that case certain species of grasshoppers, beetles, weevils, and sandhoppers are concerned. The birds become infested should they eat one of these insects, which contain gizzard worm larvae.

Effect on the Fowl.

The presence of gizzard worm is denoted by blotchy discoloration of the horny lining of the gizzard. If this is stripped away the worms will be detected in the muscle wall of the gizzard. They are usually

Plate 8.
Gizzard Worms (Natural Size).

found in that portion of the gizzard wall near the entrance of the stomach. The worms burrow into the muscle coat, occurring in soft nodules thus causing the muscle to become soft and spongy. The gizzard may lose its shape, and may even rupture from the infested area. (Plate 9.) It thus loses its function as a grinding organ, and the infested birds lose condition, become weak, and may die.

Plate 9.
Gizzard of Fowl Infested with Gizzard Worms.

Treatment and Control.

Treatment is very unsatisfactory, as the worms, lying concealed in the muscle tissues, are protected from vermifuges. Carbon-tetrachloride, as recommended for the large roundworm, should be tried.

Prevention of infestation is, therefore, very important. Sanitation and measures to prevent the birds coming into contact with infested insects should be enforced. The elimination of conditions which provide shelter and breeding grounds for these insects is also necessary. The sandhopper, which is small, pale, and shrimp-like in appearance, is, for example, found breeding in areas which are shaded and moist. Measures for its control are obvious. Like the woodlouse, it is not an insect, but is related to the shrimp.

Plate 10.
HAIRWORMS (NATURAL SIZE).

HAIRWORMS (Capillaria spp.) (Plate 10).

Two species of hairworms have been found in poultry in this State. One species is found in the intestine, the other in the caecum. Only the former species, *C. columbae*, is of any importance. These are extremely slender hair-like worms, which may grow up to nearly three-quarters of an inch in length. They are very difficult to detect with the naked eye, and are best seen when the washings from the intestine are examined in a glass dish, held over a black surface.

Life Cycle.

Birds become infested when they swallow eggs containing larvae. The young larva on being set free in the alimentary canal of the bird settles down in the intestine or caeca and becomes mature in about three weeks.

Effect on the Fowl.

Heavy infestations cause loss of weight, weakness, and death. Affected birds assume a depressed attitude with ruffled feathers and drooping wings. The worms may cause a serious enteritis, which is manifested by diarrhoea in which numerous pinkish-coloured shreds of mucus may be seen.

Treatment and Control.

There is no satisfactory treatment known, though carbontetrachloride as recommended for the large roundworm might be tried.

Infestation can be prevented by giving attention to the regular removal of droppings and other features of sanitation.

THE CAECUM WORM (Heterakis gallinae) (Plate 11).

This is an extremely common parasite of the fowl and other poultry, such as turkeys. It inhabits the caeca, is whitish in colour, and about half an inch in length. In the caeca, it is frequently found in greatest numbers at the blind tips.

Plate 11.
CAECUM WORMS (NATURAL SIZE).

Life Cycle.

Should conditions be favourable, the egg, which is passed in the droppings, reaches the infective stage in about five days. At this time it contains a tiny coiled larva. When such an egg is swallowed by a bird the larva is set free and makes its way to the caeca. It then invades the wall of the caeca, where it remains to about the fifth day. Returning to the lumen of the caeca, it settles down and grows to maturity, which is reached twenty-four days after infection.

Effect on the Fowl.

It is claimed that the caecum worm can be serious among young chicks, causing diarrhoea and death. It is of little importance among older birds, in which, moreover, heavy infestations are rarely seen. This worm, however, is a vector of blackhead, a disease affecting the caeca of poultry, and which is associated with a high rate of mortality among turkeys. At times, also, blackhead can be very serious among very young chickens.

Treatment and Control.

The flock treatment with nicotine sulphate, as advised for the large roundworm, will remove a fair percentage of caecum worms also. The United States authorities recommend enemas of oil of chenopodium in cotton seed oil. For a bird weighing $1\frac{1}{2}$ lb., one-tenth cubic centimetres of chenopodium is given in 5 cubic centimetres of cotton seed oil.

EYE WORM (Oxyspirura mansoni) (Plate 12).

This is a slender whitish worm, measuring up to three-quarters of an inch in length, which is found under the nictitating membrane of the eye. (This is a thin membrane which passes over the eyeball when the fowl winks.) It is of interest only to poultry farmers in North Queensland, as it is unknown south of Rockhampton.

Plate 12.
EYE WORMS (NATURAL SIZE).

Life History.

The eggs laid by the female worms in the eye pass down the tear ducts into the throat, are swallowed and are eventually passed out in the droppings. These have then to be eaten by a particular species of cockroach before further development can occur. Should an infested cockroach be eaten by a fowl, the worms free themselves in the mouth of the bird and passing up the tear ducts take up their position in the eye.

Effect on the Fowl.

Eyeworm infestation is denoted by constant winking, rubbing the eye against the wing, and scratching the eye with the foot. The eyelids become inflamed and swollen, and there is a discharge from the eyes and nose. Occasionally the eye may be covered with a cheesy mass. As a result of infestation blindness frequently results. The affected birds lose condition and assume an unhealthy appearance. Eye worm may also be serious among young ducks, though, as a rule, it infests only the fowl.

Treatment and Control.

Infested birds may be freed from the worms by placing a few drops of turpentine, or a 2 per cent. solution of creolin in the eyes. After about half an hour the eye is washed in lukewarm boracic water, and the worms removed with a small soft brush.

Prevention consists in applying the principles of sanitation and eliminating conditions which encourage cockroaches. The use of an insect spray will assist in controlling these insects.

EXTERNAL PARASITES.

The external parasites of the domestic fowl include the poultry tick and several species of fleas, lice, and mites.

A B

Plate 13.

The Poultry Tick (much Enlarged).—A. Male. B. Female.

THE POULTRY TICK (Argas persicus) (Plate 13).

This is a flat, oval, brownish tick about one-quarter to half an inch in length. The mouth parts are situated ventrally between the front legs, and it is only by turning the tick on its back that these can be seen. It is a powerful bloodsucker, and, like the bed bug, feeds only at night, remaining hidden in cracks and crevices in the fowlhouse during the day.

Life History.

The female tick may lay 500 to 900 eggs during her lifetime, in several batches. These eggs are deposited in sheltered positions, and under favourable conditions may hatch in about ten to fifteen days. The tiny tick that emerges from the egg has only three pairs of legs, and almost immediately after hatching attaches itself to the fowl, preferring the skin on the breast, under the wing, and on the thighs for this purpose. In three to ten days' time it is fully engorged with blood, and, leaving the fowl, seeks a suitable hiding-place, in which it casts the skin, to appear later as an eight-legged nymph. There are two further moults before the adult stage is reached, but, like the adult, these nymphal stages feed only at night.

Effect on the Fowl.

When ticks are numerous, their bloodsucking habits result in distinct injury to the birds attacked. This is due to the amount of blood sucked up by the ticks and to poisonous substances injected whilst feeding. Young chickens are most seriously affected, and the weakness caused by the tick may often be fatal.

The fowl tick is also very important as a carrier of an organism which is responsible for fowl tick-fever, or spirochaetosis, which is a serious and usually fatal disease among fowls.

Control.

The fowl tick is a very difficult pest to control, as not only is it resistant to ordinary insecticides, but its habit of hiding in deep cracks, &c., protects it to a very large extent from any spray treatment. Ticks also frequently shelter under the bark of trees and in crates, &c., which are near the fowlhouse, or are used by birds at night. A badly infested fowlhouse, if of little value, should be burnt as it stands. As adult ticks are able to live as long as four years and more in an empty fowlhouse, it is of little use excluding the fowls for any length of time in an attempt to kill the ticks by starvation.

Crude oil or creosote makes a satisfactory spray, and should be forced well into all cracks and crevices, &c. Before spraying, all litter, nesting straw, and loose boards likely to protect the ticks should be removed and burnt. The spraying treatment should be repeated every three to four weeks until no more ticks are seen.

In addition to spraying, fowls may be protected from the ticks if the perches are so arranged as not to touch the fowlhouse walls. They may be swung from the roof on wires, or else placed on supports rising from the floor. Cups of oil are placed around the wires or supports. The perches should be moveable and frequently painted with crude oil. Nesting boxes, moreover, should be placed well away from the roosts, and are best constructed of metal.

Special coops should be set aside so that any bought fowls may be quarantined as a precaution against bringing in fresh infestations. The period spent in these coops should be about twelve days, and the coops should be kept thoroughly clean and well sprayed.

LICE.

The lice found on the domestic fowl are all biting lice, of which there are several species occurring on fowls in Queensland. The various species are given popular names according to the part of the body or feathers on which they are most frequently found—namely, wing lice, head lice, body lice, shaft lice and fluff lice. The various species are illustrated in Plate 14, figs. 1-6.

Lice infestation is most serious among chickens, and the irritation resulting from their presence may sometimes be fatal. Among grown fowls lice infestation is shown mainly by a decreased egg production.

The two most important lice are the head louse, *Lipeurus heterographus* (Plate 14, fig. 4), and the body louse, *Eomenacanthus stramineus* (Plate 14, fig. 5). The former occurs in the region of the

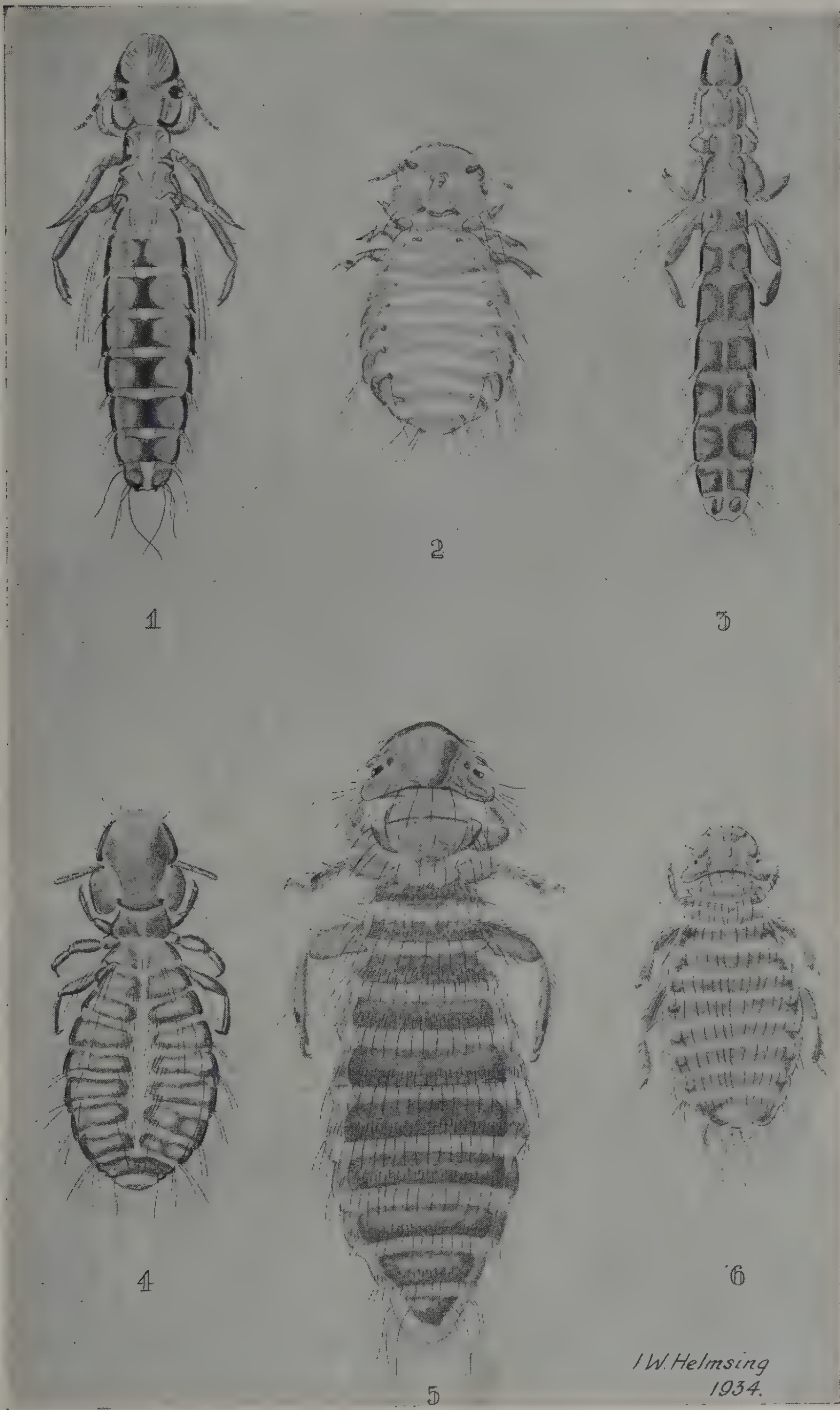

Plate 14.
POULTRY LICE.

Fig. 1.—Wing louse x24.
Fig. 2.—Fluff louse x24.
Fig. 3.—Slender pigeon louse x24.
Fig. 4.—Head louse x24.
Fig. 5.—Body louse x24.
Fig. 6.—Shaft louse x24.

head, and is very injurious to young chicks, and on occasions even to grown fowls. The body louse occurs mainly on grown fowls, and is a source of serious irritation, resulting in a reddened, scabby skin unthriftiness, and a decrease in egg production.

Control of Lice.

Lice may be controlled with sodium fluoride, used either as a powder or as a dip. One treatment, if carefully carried out, is sufficient to kill all lice and their eggs.

Used as a powder, sodium fluoride may be applied in pinches to the base of the feathers in the region of the head, neck, back, breast, vent, wings, tail, and thighs, or it may be mixed with flour in the proportion of three parts of flour to one part of sodium fluoride and applied by means of a shaker.

Where large numbers of fowls are concerned, it may be considered more convenient to apply the sodium fluoride in the form of a dip, 1 oz. to each gallon of water. Only warm, sunny days should be chosen for dipping, and the fowl is plunged into the dip with the wings outspread. The fluid is then worked into the feathers with the fingers and the head ducked once or twice.

A more convenient method of control is to paint the perches with nicotine sulphate just before the birds go to roost. The treatment should be continued for two or three nights, and then repeated in nine to ten days' time. With this treatment ventilation of the poultry house is important. If insufficient, the birds may be affected by the fumes from the nicotine sulphate. If the poultry house is too open, on the other hand, the fumes are too rapidly disseminated to be effective.

THE TROPICAL FOWL MITE (Liponyssus bursa) (Plate 15).

This mite is very small in size, being no larger than a pin's head. It may be seen on poultry at any time during the day and night, and owing to its bloodsucking habits, is distinctly injurious, especially to chickens and young poultry. Sitting hens may be so irritated by it as to leave the nest. On the fowl this mite occurs in greatest numbers below the vent, about the tail, and sometimes on the neck. A heavy infestation gives the feathers a dirty appearance, and the skin becomes irritated and scabby.

The female mite deposits her eggs among the feathers and in other places such as the nesting straw, where the young mites hatch. They may thus complete their life cycle without leaving the fowl.

This is the species commonly seen in fowlhouses in Queensland. When in numbers, the mites may crawl on to the arms and body of the poultryman when handling infested fowls or nesting straw and cause severe irritation. The tropical fowl mite may be transported by starlings, pigeons, and sparrows, and is also concerned with infestation of houses, popularly held to be due to "starling lice."

Control.

Spraying with crude oil or creosote and the burning of all litter and nesting straw is advised. In addition, individual treatment of all fowls by dipping in a mixture of 1 gallon of water, 2 oz. of flowers of sulphur,

and 1 oz. of soap is necessary, taking care to wet the feathers thoroughly. Alternatively, dusting with flowers of sulphur will be found satisfactory, but is not considered to be as efficient as dipping.

A more convenient treatment is to paint the perches with nicotine sulphate just before the birds go to roost. The treatment should be repeated three times at intervals of three days. For precautions regarding the use of nicotine sulphate, see under "Control of Lice."

Plate 15.
THE TROPICAL FOWL MITE (MUCH ENLARGED).

RED MITE (Dermanyssus gallinae).

This mite is very similar to the tropical fowl mite in appearance, but, like the poultry tick, feeds only at night, and with few exceptions—for example, in the case of sitting hens—is not found on the birds during the day. The red mite is also a bloodsucker, and when in numbers may be regarded as a serious parasite. Its eggs are laid in the cracks and crevices in which it hides by day. Like the poultry tick, the red mite is a vector of fowl tick fever.

Control.

Red mite control may be accomplished by spraying with crude oil or creosote, and by the destruction of all litter. Dipping in this case is not required. Spraying should be repeated every three days till no more mites are seen.

The nicotine sulphate treatment recommended for the control of the tropical fowl mite is also very effective for the control of red mite.

SCALY-LEG MITE (Cnemidocoptes mutans).

This itch mite, as its name implies, is responsible for a condition among poultry known as scaly-leg. Mite attack is usually confined to the legs, though occasionally it has been known to include the comb and wattles. The mites, burrowing in beneath the scales, cause the formation of large crusts. They usually commence their attack between the toes, and gradually extend up the unfeathered portion of the leg. In severe cases the birds become lame and walk with difficulty, and may rapidly lose condition.

Control.

The mites spread mainly by contact or from the perches, so no hesitation should be shown in treating affected fowls. An effective remedy is crude oil, into which the legs are dipped and washed with a hard brush. The treatment should be repeated after thirty days. The perches should also be painted with crude oil.

DEPLUMING MITE (Cnemidocoptes gallinae).

This mite lives at the base of the feathers and causes an intense itching, as a result of which the affected bird pulls out the feathers. If the stumps of the feathers are examined, they will be found surrounded with scales and crusts, whose presence distinguishes depluming mite infestation from moulting or the vice of feather-picking.

Control.

Dipping in the mixtures used for tropical mite control is recommended.

FLEAS.

Fleas can at times be very injurious pests of poultry. The most harmful species is the sticktight or stickfast flea, *Echidnophaga gallinacea*, which, fortunately, does not occur in Eastern Australia. Occasionally, however, birds in Queensland may become infested with other species of fleas, such as the dog flea, *Ctenocephalides canis*, the cat flea, *Ctenocephalides felis*, and the human flea, *Pulex irritans*. These pests, through their bloodsucking habits, may so irritate the birds as to cause a marked decrease in production.

Control.

Fleas breed in the dust and litter of the fowlhouse floor, and of shaded areas in the yards. Control may be accomplished by—

(1) Removal and burning of all dust and litter.

(2) Dampening the breeding sites with water and keeping them damp for about two weeks.

(3) Spraying thoroughly with crude oil or creosote.

Pineapple Plant Selection.

With Special Reference to the Elimination of Inferior Types.

H. M. GROSZMANN, B.Sc.Agr., Assistant to Research Officer.

THE plants and fruit in any pineapple field, and especially in a plant crop fruiting in summer vary greatly in appearance. Fruit may differ considerably in size and shape, crowns may be single, double, or multiple, the fruit stalk may be long or short, slips may be absent or number as many as twenty, suckers may be absent or may be more than six in number, and these may be either low-set on the plant or high up almost at the base of the fruit stalk. Some fruits are of a desirable type, others are marketable but inferior, whilst still others are so inferior as to be useless. On some plants the suckers are vigorous and early, whilst on others they are late and poorly developed, and consequently bear late or carry small fruit. In short, some plants and fruit are much better than others, and it is obviously desirable to produce more of the former and to reduce and ultimately eliminate the latter.

Basis of Pineapple Plant Selection.

The elimination of inferior plants and fruit may be achieved, but, in order to do so, it is necessary to understand why some plants are superior to others, and for this there are two main reasons. Firstly, the production of plants and fruit of a desirable type is closely linked with the adoption of correct cultural methods. Secondly, there are, within any given variety of pineapple, some strains which tend to produce superior fruit, while there are other strains which tend to produce inferior fruit, no matter how favourable the environment may be. These facts form the basis of pineapple selection work.

Among the many slips, suckers, and crowns that have been planted in Queensland, there have occurred, from time to time, undesirable plants differing from the parent type, and continuing the difference in their progeny, thus originating new and undesirable strains. Therefore, undesirable types fall into two categories. Firstly, there are individual plants of the better strains which have developed a defect owing to the existence of some unfavourable factor in the environment, and, secondly, there are plants which come from inherently poor strains. Before endeavouring to improve the plant type by selection, however, it is necessary to know to which category any abnormal plant belongs: if the defect be due to the environment, improvement can be effected by improved cultural methods, whereas, if the defect be hereditary, material from the undesirable plant should not be used in future plantings, because it is incapable of giving the necessary response to improved methods of cultivation.

Objectives of the Pineapple Plant Selection Work now in Progress.

A programme of work was drafted late in 1937, in which it was proposed to study the Smooth Cayenne, the most important commercial variety in Queensland, in order to ascertain which abnormalities might be hereditary, and also to discover whether there might be any superior strains, which could be multiplied to replace the average type now planted. This work has not yet been completed, but, from evidence already obtained, and from results of research conducted elsewhere, it is possible to make recommendations which, if followed, must improve considerably the class of plants in Queensland pineapple plantations.

Varietal Strain.

Attention has just been directed to the existence, within any pineapple variety, of separate strains, which, in the case of the Smooth Cayenne, are numerous. Some of these strains can be recognised very easily as being distinct, while there are others which a casual observer would fail to notice. Now, if a single plant be taken, all the progeny derived from that plant in successive plantings by vegetative means, that is, by crowns, slips, suckers, or any other offshoots, but not by seed, will belong to one type or strain, namely, that of the original plant. All of these plants are said to belong to the one clone, and any differences within the clone are due normally to the environment. In any field there may, of course, be numerous plants of any one clone, but it is difficult, when choosing a number of plants, to be sure of choosing from the one clone, as very slight hereditary differences may be overlooked. However, all plants derived vegetatively from any one selected plant, that is, all the plants within one clone, belong to the one strain. Consequently, when attempting to develop a particular strain, it is customary to begin with one plant of that type and to grow its progeny by themselves. Occasionally a change of an hereditary nature will occur in a clone, giving rise to a new strain, but these changes or mutations, as they are termed, are comparatively rare. Consequently, for practical purposes, if one plant be selected and its progeny kept separate, these may be taken as belonging to a single strain.

Although it is not suggested that the individual grower should attempt to select superior strains, he is strongly advised to cull out all inferior types. The selecting and testing of superior strains is a slow process, but the culling of poor types should produce a rapid and marked improvement, particularly on those farms where such poor types are very prevalent.

Types of Pineapple Planting Material.

Before discussing inherently defective types, it is well to define the various vegetative portions of the plant that are used in propagation, and to describe what plant and fruit characteristics are desirable. Considering first the planting material, there are three main types, namely, slips, suckers, and crowns, all of which are of a vegetative nature as distinct from the seed. These may be best described by considering a normal plant which has matured its first fruit. On top of the fruit is the crown or top. Below the fruit, on the fruit stalk, are offshoots called "slips," "robbers," "buttons," or "gill-sprouts," bearing secondary fruit at the base; in this article the term "slips" will be used exclusively to designate such offshoots. Below the fruit stalk, and originating generally above but sometimes below ground level, are offshoots called suckers, which arise from the axils of the leaves on the stem. Normally these suckers will grow considerably and the following season will bear fruit termed the first ratoon crop. Occasionally, offshoots develop at the base of the fruit stalk which lack the secondary fruit found at the base of the slip, and which in general can be described as intermediate in character between the sucker and the slip. In addition to these main types, the "butt" or stem of an old plant is sometimes used as planting material. In selection, the use of butts is not recommended, as little can be known of their true characteristics, because butts are usually obtained from the oldest plantings on the farm.

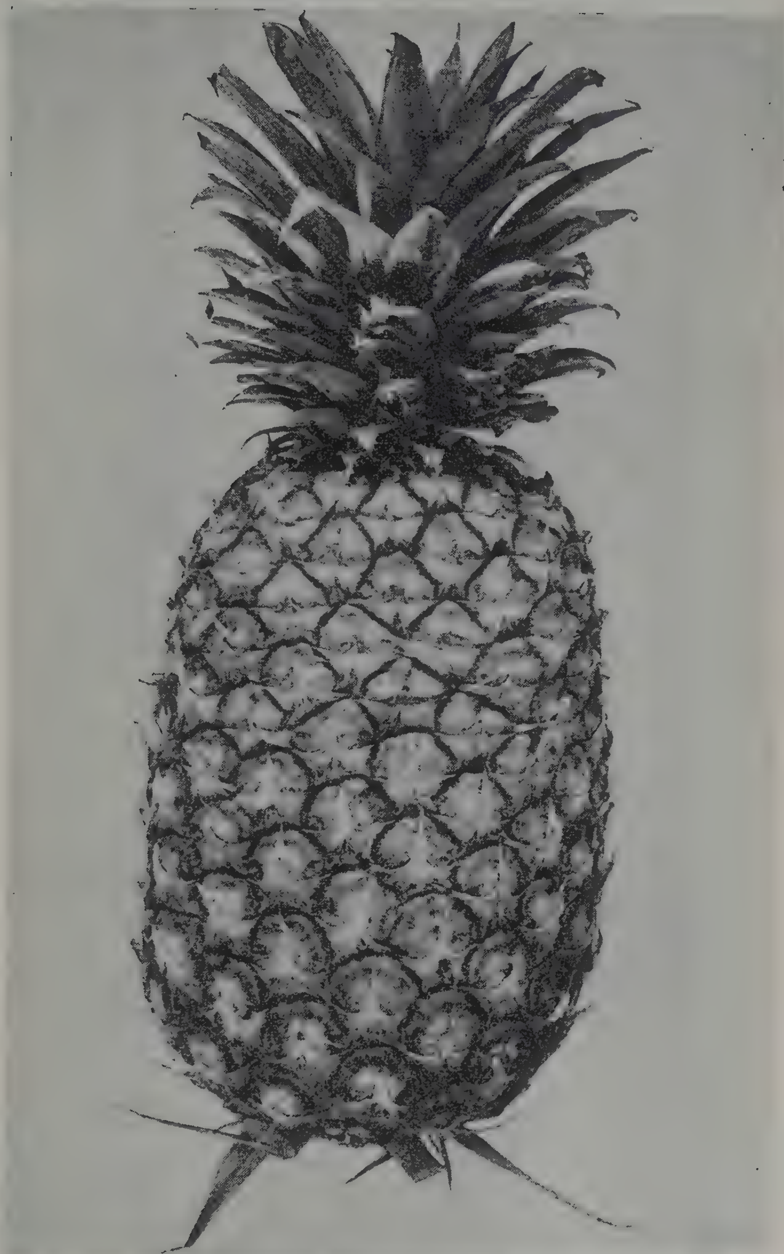

Plate 16.
FRUIT OF DESIRABLE TYPE.

Fruit and Plant Characteristics on which Selection is Based.

A good fruit (Plate 16) should be long and cylindrical, not cone-shaped, of good diameter, with square shoulders and base, flat eyes, and small core. The crown should be small and single, and the fruit stalk should be short. The slips should not exceed four in number, and should neither be clustered near the base of the fruit nor growing from it. (Plate 17.) The stem of the plant should be short, as high plants (Plate 18) have a tendency to fall over when fruiting. The suckers should originate close to the ground and should be about half grown when the fruit is mature so that they will afford a measure of protection

Plate 17.
DESIRABLY PLACED SLIPS.

against sunburn (Plate 19) and also provide an early ratoon crop. The number of suckers is influenced by the growing conditions, well grown plants, as a rule, producing more suckers than plants which have grown under adverse conditions. The grower must therefore take into account the conditions under which the plants have been grown. In a field where growth is vigorous and suckers are prolific and generally well developed, it is necessary to avoid plants with few or weak suckers, since they may belong to strains defective in this respect.

Part of the Departmental selection programme has been the planting and study of a number of clones of desirable plant types, and this work has made it evident that the type of plant and fruit

Plate 18.
A High-stemmed Plant.—Suckers too high.

Plate 19.
Well-set Low Fruit.—Note position and development of suckers, and the protection afforded the plant against sunburn.

Plate 20.

WINTER FRUIT TYPE.—Conical and high on the plant. The suckers are not so far advanced as those in Plate 19.

Plate 21.

COLLAR-OF-SLIPS.—Representative type.

within the one clone varies with the season of fruiting. Thus with plant crops maturing their fruit in winter, the fruit is more conical (Plate 20), the eyes more protruding, the fruit stalk longer, the slips fewer, and the suckers later than is the case with plants which mature their fruit crop in summer. The summer-fruiting plant approaches more closely the desired type, and it is advisable in the present state of knowledge to choose summer plant crops for selection work. Furthermore, this

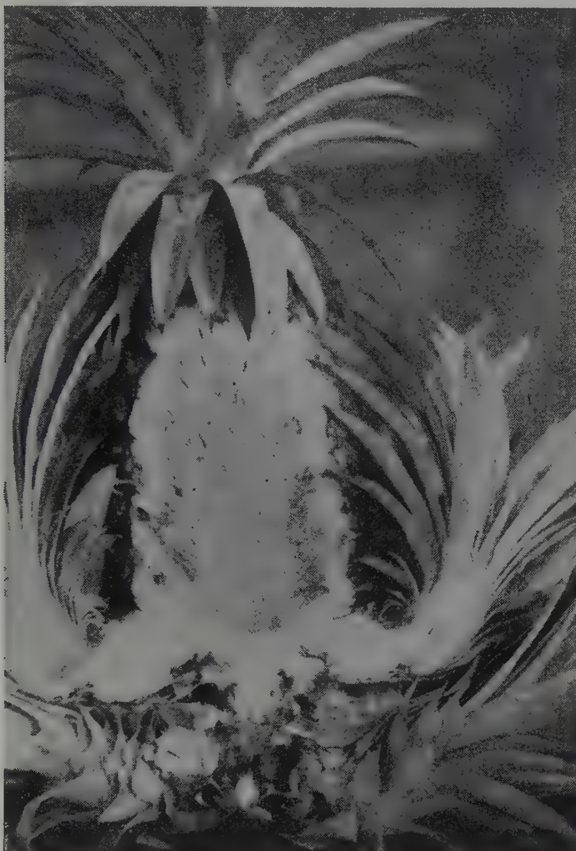

Plate 22.

COLLAR-OF-SLIPS.—Longitudinal section showing slips originating from the base of the fruit.

crop yields more slips for propagation. When these are to be used for planting material, the fruitlets should be removed with a knife when the slips are plucked, and the slips then placed in a shaded position base uppermost, so that the cut end will seal. Treated in this manner it will be found that they will be quite suitable for planting even after several months.

Abnormal Strains in the Smooth Cayenne Variety.

An attempt has been made, by examining a large number of plantations in several districts, to ascertain what are the chief hereditary defects, and to estimate the percentages of these abnormal or "off"

types. The number of inherently abnormal strains in the Smooth Cayenne variety is large, and at least fifteen have been recorded in Queensland plantations. Of these, however, the only markedly undesirable ones occurring in large proportions are the "collar-of-slips," "long tom," "dry fruit," and "bottle-neck" types. Owing to the vigorous nature of these types, and the large number of slips they produce, they will increase rapidly if no form of selection be practised.

Collar-of-slips and its Modifications.

The collar-of-slips type (Plates 21 to 23) is distinguished by the presence of slips rising from the base of the fruit itself. Usually, however, but not invariably, there is an excessive number of slips, not all of which arise from the base of the fruit. Furthermore, the fruit, which also frequently carries knobs at the base in addition to slips, is often small and tapered at the top. Suckering is generally greatly retarded. Removal of the slips is troublesome, owing to the time involved, and tearing of the tissues may lead to leaking of the fruit. The collar-of-slips type is consequently very objectionable.

Plate 23.
COLLAR-OF-SLIPS.—All five plants of the one clone showing the defect.

In Hawaii it has been found that in the progeny of collar-of-slips plants, not only the true collar type occurs, but also three others—viz.: "near-collar," "knobby," and apparently normal types. In the near-collar type (Plate 24) slips are numerous and clustered around the base of the fruit but do not originate from the base of the fruit itself. The knobby fruit (Plate 25) may be quite normal as regards production of slips, but knobs, varying in number and size, are produced at the base of the fruit. As it is very likely that these are merely environmental modifications of the collar-of-slips type, and that such plants may give the same types in their progeny as the true collar-of-slips, it is evident that selection which avoids only the true collar type may fail to eliminate completely this strain.

The near-collar and true collar types are often indistinguishable until the fruit is picked. Frequently, however, a vigorous plant of the normal strain bears six to eight slips fairly close to the fruit. This can be confused easily with the near-collar type, but generally the slips are neither so numerous nor so close to the fruit as is the case with near-collar. With the near-collar and the true collar types, the slips

Plate 24.

NEAR-COLLAR TYPE.—A sectional view, showing that the slips do not arise from the base of the fruit.

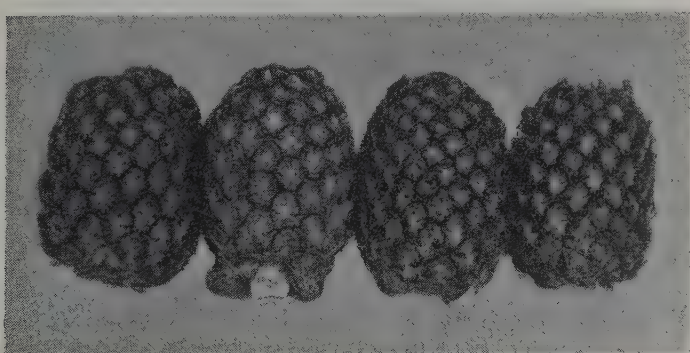

Plate 25.

THREE FRUIT SHOWING DIFFERENT DEGREES OF KNOBBINESS.—Compare with the normal fruit on the left.

rise so close to the base of the fruit as to break the bracts (Plate 27) at the top of the fruit stalk. With the vigorous plants mentioned above, the slips are a little lower, so that the bracts remain intact (Plate 28) as may be seen when the fruit is picked. In attempting to eliminate collar-of-slips, the allied near-collar and knobby types also should be culled when selecting planting material. A good method is to remove all the slips from these plants when the fruit is half grown, as not only has the grower then more time for such an operation than when picking the crop, but, in addition, the size of the fruit and the sucker growth benefit by the early removal of these slips. In this connection it is well to add that whenever slips are not required for any purpose, it is

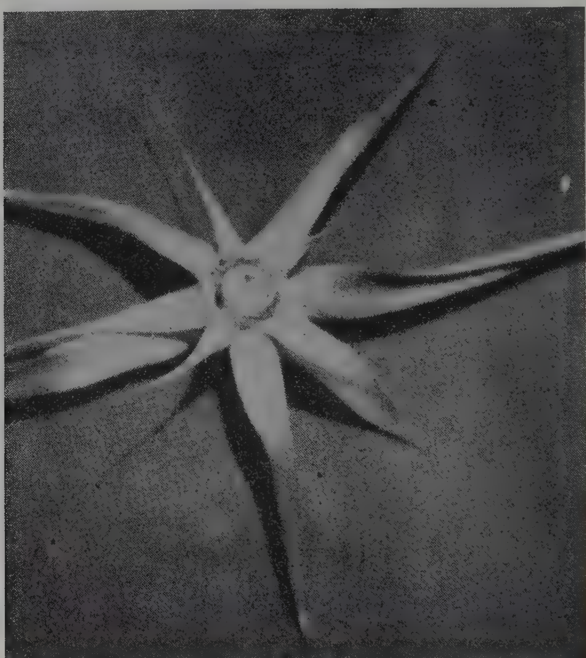

Plate 26.
THE BRACTS BELOW A NORMAL FRUIT.—Viewed from above.

advisable to remove them long before fruit maturity, and also, that when they are to be planted, they should not be left on the plant more than a month after the time the fruit is picked, but should be dealt with as described in an earlier paragraph. As a rule, true collar and near-collar plants produce an excessive number of slips, so that, by breaking off and discarding slips from all plants bearing more than four, and from all plants bearing slips on the fruit, as well as from plants bearing knobby fruit, these types will be greatly reduced. Selection along these lines possesses the slight disadvantage that some plants, not of the collar-of-slips type, may have more than four slips.

It is to be noted that the normal type of Smooth Cayenne pineapple grown in Queensland produces scarcely any slips when fruiting for the winter crop, while the collar-of-slips type averages about three slips per plant during the winter season. Is is therefore inadvisable to use slips from plants that mature fruit during the autumn, winter, or spring months.

Plate 27.

TORN AND DISTORTED BRACTS OF THE COLLAR-OF-SLIPS AND NEAR-COLLAR TYPES.—Viewed from above.

Plate 28.

A TYPE HAVING POINTS OF SIMILARITY WITH THE NEAR-COLLAR.—Distinguished by the slightly lower origin of the slips and the lack of distortion of the bracts.

Plate 29.
LONG-TOM FRUIT TYPE.—Note knobs at the base.

The Long Tom Type of Abnormality.

The long tom type (Plates 29 and 30) is distinguished by the length and narrowness of the fruit which is, in addition, generally very knobby. Knobs may occur not only at the base (Plate 29) but also on the shoulders (Plate 30). The fruit usually matures late and, as suckering is delayed, the ratoon crop may not mature until the season following that in which ratoon fruit is produced by normal plants. Slips are numerous, but they are not always clustered at the base of the fruit. Often the fruit, though still of distinct shape, may be of quite good size, but, if produced under adverse conditions, it is mostly of an inferior type and even vigorous plants frequently are found to bear poor fruit. Observations indicate that this strain persists very close to type from generation to generation, so that there should be little difficulty in eliminating it.

The Dry Fruit and Bottle-neck Abnormalities.

The dry fruit and bottle-neck types (Plate 31) are somewhat alike, and instances have been recorded where both these fruit types have occurred on plants from the one parent. At the same time, it is possible that there are clones which run true to one or the other type. In the dry fruit type the fruit is small, the flowers are usually absent, and the fruitlets do not develop. In the bottle-neck type the lower fruitlets develop whilst the upper ones remain undeveloped, giving the upper portion an appearance similar to that of the dry fruit. The plants are vigorous and bear many slips and suckers, but, as the fruits of both types are useless, the plants should be eradicated.

General Considerations for the Elimination of Undesirable Types.

The grower should note that in eliminating undesirable types the removal of the slips from such plants before they are mature, or their rejection in any other manner as planting material, will be fully effective only if he takes care not to use the crowns or the suckers from such plants.

It should be borne in mind that off types are much more prevalent among plants fruiting late in the season than among early fruiting ones, and also that they constitute a big proportion of the hold-over population of a plant crop field. Consequently, the grower should exercise great care in selecting from late-fruiting and hold-over plants. The term "hold-over" is applied to those plants which carry their first fruit later than the majority of individuals of a plant crop field.

The main abnormal types have been discussed, but there are many other hereditary abnormalities, most of which are of little or no consequence, while the status of others cannot be definitely determined until further studies have been conducted. The importance of an off type is measured by its value as compared with the normal plant, together with the proportions in which it occurs. However defective a type may be, unless it produces numerous slips or suckers, it is not likely to be of any great importance, whereas another type not nearly so inferior, but much more prolific, may lead to far greater losses. Also, there are types, such as some of the leaf colour mutations which, as they are neither very defective nor very prolific, are of little consequence. However, it is sound practice to avoid planting any abnormal type whether or not it be known to be hereditary, unless it appears to be definitely superior.

Plate 30.
LONG-TOM FRUIT TYPE.—Note knobs on the shoulders.

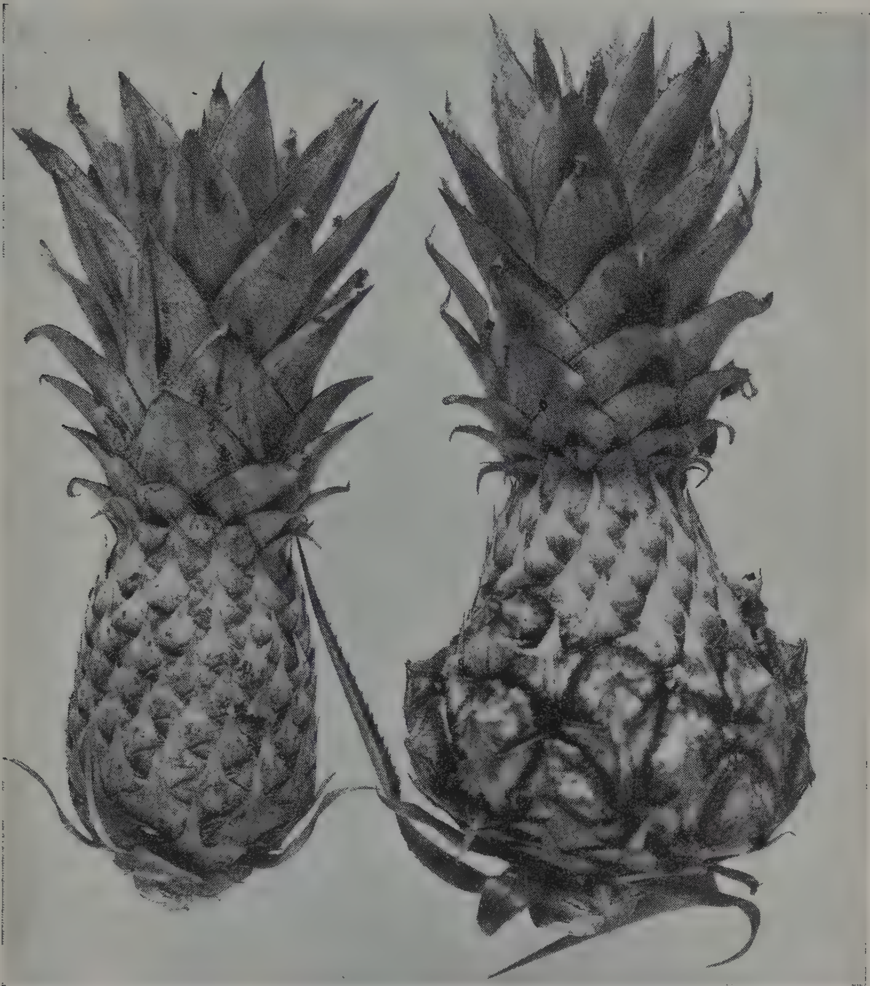

Plate 31.

DRY AND BOTTLE-NECK FRUIT.—Dry fruit on the left. The fruitlets do not develop, as the flowers are either absent or rudimentary. Bottle-neck fruit on the right. Similar to the dry fruit, except that the fruitlets towards the base are normal.

Types of Crowns.

Variation in the types of crowns may present a problem to the grower. Observations have shown that within the one clone, and in plantings of single crowns, single, double, and multiple crowns may occur on the first or plant crop fruit. Such variations are in some way due to environmental causes, and it is believed that little improvement can be effected in this case by selection; nevertheless it is sound practice in selecting planting material to avoid those multiple crowns which have a wide junction with the fruit and which are associated with flattening of the fruit and of its core.

Practical Methods of Pineapple Plant Selection.

Selection of planting material is best practised on plant crops, preferably on summer crop fruit. Ratoon crops are not so suitable, as in these the true nature of the parent plant is not always obvious, and certain defects may be less in evidence than in a plant crop. The main method of selection suggested for the grower at present is the culling of defective types, and this may be achieved by breaking off and discarding slips from such plants when the fruit is partly developed. If suckers from the same field are to be used for planting material, those on poor types of plants must be removed, or marked in such a way as to avoid confusion. Similarly, if tops are to be used for planting, those from inferior plants should be marked before picking the fruit.

Some growers may wish to accelerate the improvement in plant types by planting small separate areas with material taken from plants that are better than the average. A suitable procedure for that objective is to mark such plants with white paint just before picking the fruit. The slips, suckers, and crowns that are taken from each of these plants should be kept separate and planted so that successive clones are placed in the row alternately 3 inches to the right and 3 inches to the left of the line of the row. For example, if five plants be taken from each of three clones, the first five will be planted in a straight line, the second five will be 6 inches to the left of the first, and the five plants of the third clone 6 inches to the right of the second clone, and thus in line with the first. In this way, all risk of confusing the clones will be eliminated. When the first crop matures, a further selection should be made in which all planting material on clones which are late and on those in which any plant shows a marked defect, should be discarded. The planting material from the remaining clones may then be planted without further segregation, and will provide a nucleus of good plants to be increased from season to season.

In conclusion, it must be noted that one characteristic alone, such as the size of the fruit or the vigour of the plant, is not sufficient to establish the superiority of a strain, and the grower is advised to aim at a good uniform type which may be relied upon to crop evenly, thereby greatly simplifying tillage, fertilizing, and harvesting operations.

QUEENSLAND SHOW DATES, 1939.

July.

Bowen	5th and 6th
Ayr	7th and 8th
Cleveland	7th and 8th
Esk Show and Campdraft	7th and 8th
Townsville	10th to 13th
Nambour	13th to 15th
Rosewood	14th and 15th
Charters Towers	18th to 20th
Laidley	19th and 20th
Maleny	20th and 21st
Innisfail	20th to 22nd
Cairns	25th to 27th
Gatton	25th to 27th
Caboolture	28th and 29th
Tully	28th and 29th

August.

Atherton	1st and 2nd
Crow's Nest	2nd and 3rd
Pine Rivers	4th and 5th
Home Hill	4th and 5th
Ingham	4th and 5th
Royal National, Brisbane	14th to 19th
Jericho	25th and 26th

September.

Imbil	1st and 2nd
Canungra	2nd
Pomona	8th and 9th
Rocklea	9th
Mount Tamborine	9th
Beenleigh	22nd and 23rd
Malanda	27th and 28th
Southport	30th
Ithaca	30th

October.

Nerang	6th and 7th

Top Grafting of Grape Vines.

F. L. JARDINE, Fruit Branch, Stanthorpe.

ALMOST every grower is at one time or another faced with the necessity for working over large and old vines growing in his vineyard. In carrying out this work, invariably the procedure has been to saw off the existing vines slightly above ground level, and to cleft-graft the stumps with scions of the new variety. Where the vines are large the grafting operation is often followed by improperly healed unions which leave a large portion of dead root stock exposed to the

Plate 32.

AN EXAMPLE OF IMPERFECT UNION WHEN SCION IS GRAFTED ON TO A LARGE STOCK NEAR GROUND LEVEL.

ravages of dry rot, white ants, &c. Such a condition also constitutes an impediment to the even flow of sap in the vines and results in the vines entering into a state of premature decline when they should be vigorous with many years of profitable life ahead of them. This is particularly noticeable in the Stanthorpe district, but applies also in other grape-growing areas.

Plates 32 and 33 illustrate typical specimens of large vines which have been cleft-grafted above ground level and show how the wounds have failed to heal. Unfortunately, graft unions of this type are far too numerous.

The underlying cause of these unsatisfactory unions is to be found with the dimensions of the stock when grafted. Large stocks when sawn off near ground level expose a surface that is too great for the knitting tissue or callus of the graft to cover, and it is that portion of the stock which subsequently dies back and undermines the structure of the vine above ground.

Plate 33.

ANOTHER EXAMPLE OF IMPERFECT UNION WHEN SCION IS GRAFTED ON TO A LARGE STOCK NEAR GROUND LEVEL.

The fault is not apparent in younger and smaller vines, which can be successfully grafted, because the callus can cover the surface of the stock, making the union complete after the second or third summer. Larger vines seem to resent the drastic treatment of being sawn off about ground level. The removal of such a large portion of the vine apparently upsets the entire rooting system, leaving the vine completely unbalanced. This fact is often apparent when grafts fail to make a

union, in which case the vines, instead of sending out strong sucker growth, invariably produce weak canes which seldom, if ever, regain a natural vigour.

Plate 34.

A Vine Top-grafted at the Point Indicated by the Arrow.—Showing union almost complete.

In the course of experiments to overcome the trouble various methods of grafting large vines have been tried, and that described in the following has proved so promising that it is worthy of growers' attention.

Plates 34 and 35 show two vines which have been grafted by the new method. Each of the vines in Plates 34 and 35 has a trunk diameter of $1\frac{3}{4}$ inches about ground level. They were each grafted four years ago at the point indicated by the arrow.

The union of the vine in Plate 35 is complete, while that in Plate 34 is almost complete. The vines are vigorous and do not appear to have had any setback as a result of grafting. Apparently these vines received less shock than they would have had they been sawn off about ground level. This fact was evidenced by the strong shoots which

Plate 35.

ANOTHER EXAMPLE OF TOP GRAFTING.—The union in this instance is complete and perfect.

arose from dormant eyes on the trunk after the vines had been grafted in the spring, indicating that the root system functioned better in harmony with that portion of the vine remaining above ground.

In order to stop the young growth on the stock from taking charge and so preventing the scion buds from developing, it was found necessary to completely remove some of the shoots, while the more vigorous growth was pinched back. This had the effect of diverting the sap flow to the scion buds and forcing them into growth.

Plate 36.
A TYPICAL VINE USED IN THE TOP-GRAFTING EXPERIMENT.

When the young canes of the scion had made between 15 and 18 inches of growth all the shoots on the stock were completely removed. The growing scion canes then made rapid headway and a strong callus was formed at the union of the graft.

It is a noteworthy feature in top or high grafting in this manner that, in the event of the graft missing, scarcely ever does the stock fail to send out sturdy growth, which is not the case when grafting

Plate 37.
VINE SAWN OFF BEFORE TOP GRAFTING.

is performed close to ground level. In the case of the former, if the scions fail the lower shoots of the stock are removed, while those growing from the upper portion are encouraged to draw the sap, when it will be found that the vines can be successfully regrafted the following spring.

The results obtained from top grafting on a small scale at the outset gave sufficient encouragement to experiment with a number of vines last spring. For the purpose 265 "Gros Colman" vines with an average diameter of 2 inches about ground level were top-grafted with scions of the "Purple Cornichon" variety. The common split* or cleft graft was employed, using two scions to each graft whenever it was practicable.

Plate 38.
A STOCK WITH SCIONS INSERTED.

Plate 39.
THE FINISHED GRAFT WRAPPED ROUND WITH PAPER.

Method Adopted.

Plate 36 illustrates a typical vine in the test. In Plate 37 a vine is shown after having been sawn off in midwinter (June or July) in preparation for grafting. The grafting was completed during the month of September, the sap being well up and the vines bleeding profusely.

The cut surface of the stock (Plate 37) was first made fresh by sawing off a short section of the upper portion, care being taken that the end thus left for grafting was as straight and free from knots as possible. Next a tight ligature of stout twine was placed around the stock about $2\frac{1}{4}$ inches down from the sawn-off surface.

* This method of grafting is described in the pamphlet "Grape Culture in Queensland"—Department of Agriculture, Brisbane.

At this stage two downward sloping cuts about ¼ inch deep were made with a knife on each side of the stock 3 or 4 inches above ground level. It was found that from these cuts much sap escaped that would otherwise have flooded about the scions with detrimental results.

The top of the stock was next split with a strong knife and mallet, and when prized open with a chisel the two scions were neatly inserted, care being taken that the points of each scion extended right to the bottom of the split on the stock, thus making a perfect fit. Further tying was unnecessary, as the pressure of the cleft itself was sufficient to hold the scions in position.

Plate 40.
GROWTH OF SCIONS FOUR MONTHS AFTER GRAFTING.

The wedge section of the graft where the outer bark of stock and scion come in contact was sealed over with a grafting wax. The cuts on the top end of the scions were also sealed, while the opening of the split on the stock between the scions was plugged with wax.

Plate 38 illustrates a stock with scions inserted.

Paper of double thickness was then wrapped round the graft and tied about the base, the cup thus formed being filled with loose soil and slightly firmed down, leaving the top buds of the scions exposed (Plate 39).

The after-care of the grafts consisted of keeping the knife cuts on the stock open to permit the escape of surplus sap until it had finally subsided and, as previously explained, the treatment of shoots that appeared from dormant buds on the stock. It was also necessary to make a periodical inspection of vines exuding an excessive quantity of sap, and any congealed sap lodged about the union of the graft was removed, the paper being replaced and filled with fresh soil.

Plate 40 shows the scion growth of one of the vines four months after grafting, while Plates 41 and 42 are close-up illustrations of the

unions. It will be observed that at this stage the callus had covered almost three parts of the surface of the stock. Plate 41 also illustrates the union of the vine shown in Plate 40.

The total number of vines grafted was 265, and the number of misses was ten, of which two were blown off by the wind. A 96 per cent. strike can, therefore, be regarded as satisfactory.

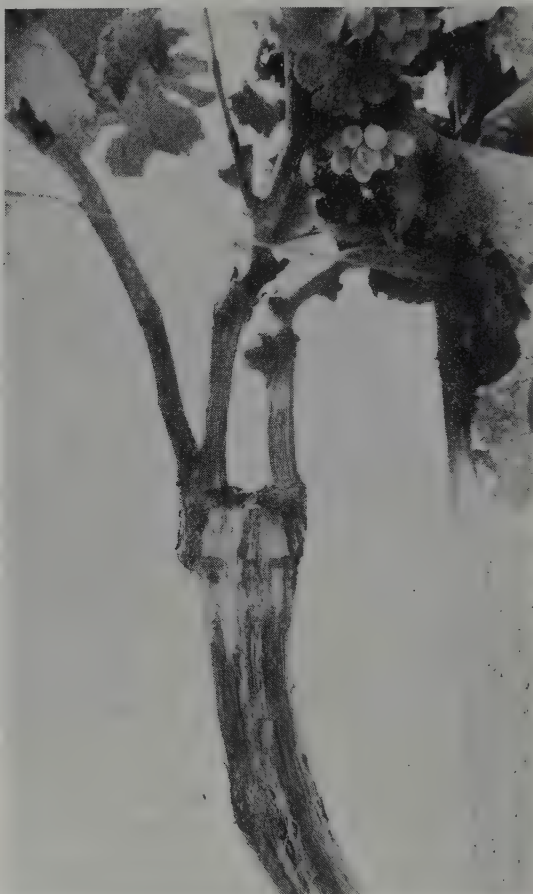

Plate 41.
FOUR MONTHS AFTER GRAFTING.—Showing the union of the scions with the stock.

At this stage top grafting is recommended for vines having a diameter between $1\frac{3}{4}$ and $2\frac{1}{2}$ inches or slightly larger about ground level. The grafting of larger vines with greater dimensions becomes increasingly difficult and uncertain, and the results in most cases are disappointing.

The method adopted for top grafting has given more satisfactory results than the one usually practised, the unions of the former being more perfect and the vines themselves less subjected to injury by the

Plate 42.

ANOTHER ILLUSTRATION OF THE UNION OF SCIONS AND STOCK FOUR MONTHS AFTER GRAFTING.

operation. It must be borne in mind, however, that top grafting entails a considerable amount of care and attention, not only in the actual operation, but in the after-care of the grafts themselves.

Thanks are due to Mr. J. Ferris, Glen Aplin, and Mr. J. Gesler, Severnlea, without whose helpful co-operation it would have been impossible to have carried out this test on such an extensive basis.

Milking into an Atmosphere of Carbon Dioxide.

M. J. GRIFFITHS, B.Sc. (Dairying), Dairy Research Laboratory.

FOLLOWING on a request received from two firms in Brisbane for information as to the merits of a Danish patent system of milking, requiring the use of solid carbon dioxide ("dry ice"), a series of experiments under practical farm conditions was undertaken. The object was to obtain bacteriological counts and make general observations on the quality of milk drawn into the Jens Grand Milking Pail, patented in Denmark, which has an atmosphere of carbon dioxide, in comparison with that of milk drawn under conditions as nearly as possible identical, but with an atmosphere of air.

This patent milking and transport pail is designed for use by farmers supplying milk depots, and consists of a 5-gallon can of squat type, fitted with a straining device at the top and a hinged, tightly-fitting lid, closing with a rubber ring. The preparation of the patent can for use is carried out at the receiving depot, and consists of thorough cleaning, sterilisation by steam, charging with about 50 grams of solid CO_2 ("dry ice"), and fitting with a cotton wool straining disc. The can is then closed and sent out to the farm, where it remains unopened until required, by which time it is filled with carbon dioxide gas. The can is used for milking direct, the milk falling on the strainer, and through this to the bottom of the pail, where it gradually displaces the heavy CO_2 gas, which in some measure acts as a preventative against the entrance of dust. When the pail is full (indicated by the oscillation of a small float), the straining wad is removed, the lid closed, and the can sent to the depot. The can is alluded to in the Danish reports as the "G-can" and this term will, therefore, be used subsequently.

The claim of the patentees that the effect on fresh milk of an atmosphere of carbon dioxide is to prevent loss of the natural dissolved gas, which amounts to approximately 5 per cent. by volume, and encourage the formation of clean lactic acid with a depressing effect on the putrefying types of bacteria, was substantiated by experimental work carried out by A. Jorgensen and V. Stein, of Copenhagen, and others at the State Experimental Dairy at Hilleroed, Denmark (1). It was, therefore, thought worth while to investigate the practical possibilities of this invention.

It was a question whether the obvious advantages of protection from dust, prevention of utensil contamination, avoidance of human handling, and of several transfers into different vessels on the farm, by milking

direct from clean cows into one sterilised vessel, would be offset by the entire lack of aeration and cooling, except such as might be afforded by the small quantity of dry ice remaining in the solid state in the can at milking time. This, it was thought, would amount to very little, and in practice, it was found to be negligible—in more than one case, no solid remained when milking was begun.

Since the experimental work was started, further reports from Denmark have been received which show that more work has been done on all aspects of the use of the G-can, and many statistics are available from experiments under practical conditions over a period (2). One Copenhagen dairy company has been using these cans regularly for part of their supply, and intends adopting them for the whole of the production. Also a number of G-cans of milk were supplied for consumption by officers in a Danish warship with apparently satisfactory results, and a patent has been applied for in the U.S.A.

Experimental.

A series of bacteriological tests was planned with the object of determining the effect of milking into the G-can charged with CO_2 on—

(i.) total numbers of bacteria,

(ii.) numbers of casein-digesting organisms,

(iii.) numbers of acid-forming organisms,

in the milk. It was intended at the same time to make observations on the practical application of the pail to ordinary farm conditions. In order to make as exact a comparison as possible, two sets of tests were made, one on milk drawn direct into the G-can, and the second on milk drawn direct through a cotton disc type strainer into a 3-gallon can fitted with lid.

Cleaning of both the cans was carried out at Peters Arctic Delicacy Company's factory, and both received identical treatment, i.e., cold water rinse; brushing with hot water containing washing soda; hot water rinse. After cleaning, they received a minimum of two minutes' steaming with live steam.

The mixed milk of two cows was used, and an approximately equal distribution was achieved by the following method:—

(i.) Two cows were selected (from a tuberculin tested herd, free from disease), giving approximately equal yields of milk.

(ii.) After washing the udders and discarding the first-drawn milk, milking was started simultaneously by two milkers, one using the covered can and a disc type strainer, and the other the G-can.

(iii.) After thirty seconds the milkers, using the same pails, changed cows. This was repeated after each thirty seconds, until milking was completed.

(iv.) The strainer was then removed from the control can, and both were closed and kept closed until sampled for testing, when the cotton disc was removed from the G-can.

It was considered that by this method a more representative milk would be obtained than would be possible from one cow, and the variations in count of different portions—foremilk, middle milk, and strippings—during milking would be nearly equalised.

A different pair of cows was used on each occasion on which tests were made.

It was not possible under these conditions to fill the cans completely with milk, so that a certain amount of air or gas was present.

The two cans were removed in a closed milk delivery van immediately after milking was completed (about 10.15 a.m.) to the laboratory, where samples were taken under sterile conditions one hour after milking, and the cans immediately closed again. After a further five hours, during which time the cans were standing at a temperature slightly below summer average (68-76 deg. F.), a second set of samples was taken and tested. The cans were again closed, and the milk remained until next morning, when it was examined for flavour and aroma.

Laboratory Method.

Bacteria were estimated by the plate count method, using milk agar (10 ml. standard agar + 0·2 ml. sterile milk), and litmus lactose agar, and plates were incubated at 37°C. Duplicate plates were poured from each dilution, and average colony counts were obtained from plates giving counts of between thirty and three hundred colonies, unless all counts were outside these limits, when the nearest figures were taken. Differential counts were made at twenty-four and forty-eight hours, total counts at forty-eight hours on milk agar plates only. Seven sets of tests were made, one set (that made on 2nd November, 1938) being discarded as some contamination appeared to have occurred in both experimental cans. This was discovered later to have been due to insufficient steaming before use.

The coliform test—inoculation into MacConkey broth (British Ministry of Health standard)—was applied to the milk (up to 0·01 ml.) at one hour and six hours old, and in the case of tests I. and II. at twenty-four hours old. It was found, however, that bacterial growth had progressed to such an extent that the ordinary milk was very near souring point, or completely soured, after twenty-four hours at 70°-76° F., so that comparative testing at this age was abandoned. The milk from the G-can was in all cases liquid at twenty-four hours.

TABLE I.

AVERAGE MILK COUNTS PER ML. AND COLIFORM CONTENT.

Milk Stored at 68°–76° Fahrenheit.

Experiment. Hours after milking.		Patent pail (G–can) + CO_2.				Covered can.			
		Casein digesters.	Acid formers.	Average total on milk agar.	Coliforms.	Casein digesters.	Acid formers.	Average total on milk agar.	Coliforms.
Exp. I.	1	20	65	260	— 1 ml.	20	25	150	— 1 ml.
	6	10	70	290	..	15	30	280	..
	24	1,900	2,610	3,260	+ $\frac{1}{100}$ ml.	34,200	4,770	43,575	+ $\frac{1}{100}$ ml.
Exp. II.	1	10	5	40	— 1 ml.	<10	20	20	+ 1 ml.
	6	25	10	320	..	3,735	130	4,085	..
	24	∞	∞ (alkaline)	∞	+ $\frac{1}{100}$ ml.	∞	∞ (acid)	∞	+ $\frac{1}{100}$ ml.
Exp. IV.	1	805	1,325	1,365	— 1 ml.	295	290	585	— 1 ml.
	6	13,000	14,250	27,500	— 1 ml.	450	1,300	7,950	+ $\frac{1}{10}$ ml.
Exp. V.	1	770	410	1,935	— 1 ml.	995	630	2,780	+ $\frac{1}{10}$ ml.
	6	850	1,800	2,500	— 1 ml.	8,950	17,100	26,050	+ $\frac{1}{100}$ ml.
Exp. VI.	1	20	330	1,510	— 1 ml.	1,750	4,650	18,200	+ $\frac{1}{10}$ ml.
	6	1,000	50	11,900	— 1 ml.	1,300	10,500	27,100	+ $\frac{1}{10}$ ml.
Exp. VII.	1	10	55	530	+ 1 ml.	16,450	1,100	60,850	+ $\frac{1}{100}$ ml.
	6	200	<100	4,750	+ $\frac{1}{10}$ ml.	55,000	280,000	1,708,000	+ $\frac{1}{100}$ ml.

TABLE II.

LOGARITHMS OF COUNTS ON MILK AGAR AT 37°C.

+ Indicates counts in favour of G–can.

Experiment.	One hour after milking.		After six hours at 70° (approx.).	
	G–can.	Covered can.	G–can.	Covered can.
	TOTAL COUNTS.			
Exp. I.	2·4150	2·1761	2·4624	2·4472
Exp. II.	1·6021	1·3010	2·5051	3·6112
Exp. IV.	3·1351	2·7672	4·4393	3·9004
Exp. V.	3·2867	3·4440	3·3979	4·4158
Exp. VI.	3·1790	4·2601	4·0755	4·4330
Exp. VII.	2·7243	4·7843	3·6767	6·2324
	Mean difference = + 0·39842		Mean difference = + 0·74718	
	Standard error ± 0·39866		Standard error ± 0·44196	
	CASEIN-DIGESTING TYPES.			
Exp. I.	1·3010	1·3010	1·000	1·1761
Exp. II.	1·000	0·6990	1·3979	3·5723
Exp. IV.	2·9058	2·4698	4·1139	2·6532
Exp. V.	2·8865	2·9978	2·9294	3·9518
Exp. VI.	1·3010	3·2430	3·000	3·1139
Exp. VII.	1·000	4·2161	2·3010	4·7404
	Mean difference = + 0·75540		Mean difference = + 0·74425	
	Standard error ± 0·60510		Standard error ± 0·5938	
	ACID-FORMING TYPES.			
Exp. I.	1·8129	1·3979	1·8451	1·4771
Exp. II.	0·6990	1·3010	0·6990	2·1139
Exp. IV.	3·1222	2·4624	4·1538	3·1139
Exp. V.	2·6128	2·7993	3·2553	4·2330
Exp. VI.	2·5185	3·6675	1·6990	4·0212
Exp. VII.	1·7404	3·0414	1·6990	5·4472
	Mean difference = + 0·3606		Mean difference = + 1·17585	
	Standard error ± 0·3285		Standard error ± 0·7146	

Results.

Average counts, together with coliform content are given in table I. A statistical analysis of these results, set out in table II., reveals a distinct tendency in favour of the G-can, although insufficient tests were made for this to be mathematically significant.

In one case only did the counts in the G-can milk, both at one and six hours, exceed those in the control can milk (exp. IV.). This may have been due to external contamination, although none was observed, no coliforms were found, and the usual precautions were taken on every occasion to minimise outside influences.

TABLE III.

FLAVOUR AND AROMA OF MILK.

Experiment.	G–can.	Control can.	Atmospheric temp. °F	Date.
Exp. I. ..	Very tallowy ..	Good	72–76	26/10/38
Exp. II. ..	Sweet; trace of tallowiness	Almost sour, unclean aroma (not tasted)	71–73	28/10/38
Exp. III. ..	Sweetish flavour, sl. tallowiness	Sickly odour, almost sour (not tasted)	68–71	3/11/38
Exp. IV.* ..	Cowy odour; flavour after aeration, sweet but not good	Trace of feed; flavour quite good after aeration	74–76	10/11/38
Exp. V. ..	Slightly stale flavour	Souring with cowy odour (not tasted)	76	16/11/38
Exp. VI. ..	Sweetish stale flavour	Almost sour (not tasted)	75	22/11/38
Exp. VII. ..	Sweetish stale flavour	Sweet but had off-flavour due to trace of feed and lack of aeration	76	24/11/38

* Strainer holder retinned and Monel metal gauzes fitted.

TABLE IV.

COMPARATIVE TITRATABLE ACIDITIES.

Experiment.	Age of milk in hours.	% Titratable acidity calculated as lactic acid.		Milk temp. °F.
		G–can.	Control can.	
Exp. VI.	6	0·32	0·15	75
Exp. VI.	23	0·31	0·16	..
Exp. VI.	23 (after aeration)	0·24	..	..
Exp. VII.	1	0·22	0·17	76
Exp. VII.	6	0·25	0·17	..
Exp. VII.	23	0·31	0·185	..
Exp. VII.	23 (after aeration)	0·24	..	..

Flavour and Aroma.—The milk was inspected, smelt, and tasted at about twenty-four hours old, to ascertain whether its suitability for use had been affected by any factor in the process of production.

The marked tallowy flavour found in milk from the G-can in the first three tests was thought to be due to the absorption of metal from the straining gauzes fitted in this can which were made of untinned brass, and the strainer holder which showed some rusting. Accordingly these were replaced, before experiment IV., with a set of Monel metal gauzes, and the strainer holder was retinned. This resulted in a complete disappearance of the tallowiness, enabling the true milk flavour to be judged.

In all cases the G-can milk showed a better keeping quality under the test conditions than milk taken in the control can.

The flavour best described as "sweetish and stale" was, however, persistently present in milk from the patent can, and, although it to some extent disappeared after aerating, which was done by pouring the milk twelve or more times from one vessel to another, it was

sufficiently obvious to spoil the palatability of the milk. At first it was thought that this off-flavour might be due to metallic contamination from the can, or parts of the can, but this was not possible after the replacement of the gauzes and retinning had been carried out, and the conclusion is that it was due to the presence of dissolved carbonic acid, which was partially given off during aeration, thus reducing the taint.

This theory is borne out by the relative titratable acidities, using phenolphthalein as indicator, of the milk in each can, and in the G-can milk before and after aeration, which are given in table IV.

According to the work of McDowall and McDowell (3), the titratable acidity at twenty-three hours of 0·31 per cent. calculated as lactic acid, represents about 55 volumes of CO_2 per cent. in solution. After aeration this was reduced to 0·24 per cent., representing 37 volumes of CO_2, a difference of 18 volumes per cent.

Discussion and Comments.

An insufficient number of tests was made to produce absolutely conclusive results, but the colony counts indicated that, judged on numbers of bacteria alone, the patent method using an atmosphere of carbon dioxide was an improvement on the same method with an atmosphere of air. With one exception the carbon dioxide had a depressing effect on total numbers of bacteria, and on the acid-forming as well as on the casein-digesting types in the milk after several hours at temperatures between 68°-76° F.

This effect was more noticeable when Coliform bacteria were found in the milk at one hour after drawing than when this first test was negative. A certain inhibitory effect, lasting for some hours, on the growth and multiplication of coliforms in milk appears to be a useful aspect of the CO_2 atmosphere. A larger number of tests would show whether the consistent absence of coliforms in 1 ml. of milk taken in the G-can (with the exception of Experiment VII.), while they were present in $\frac{1}{10}$ ml. or less of milk from the control can at six hours, was accidental (see table I).

The ratio of casein-digesters to acid-formers varied considerably, no consistent relationship being found in the G-can milk, and the acid-formers being in several cases in the minority. This is contrary to the claim of the patentees that the acid-forming types are encouraged, whilst the proteolytic types are depressed by the atmosphere of CO_2, although this might be so at a later stage.

The milk flavour, owing to precautions being taken to open the cans as little as possible on each occasion of sampling, in order not to disturb atmospheric conditions within the cans, was tasted only after twenty to twenty-four hours—much longer than the milk would normally be kept between the farm and the depot. With thorough cooling and aeration the foreign flavour, due to dissolved carbon dioxide, might be partially removed, but under test conditions, where aeration was carried out by pouring at least twelve times from one vessel to another, it was not found possible to obtain a really palatable milk. This is a grave disadvantage.

With regard to the construction of the can, it may be mentioned that the flat hinged lid is not very practical for handling, and is not

readily sterilised since it cannot be placed over a steam jet. The strainer gauzes would be more satisfactory if made of some metal harmless to milk (stainless steel or a nickel alloy), and more robustly constructed and finished. Further experiments, to find the comparative bacteria counts in milk drawn into the G-can with milk drawn under ordinary farm conditions, strained, and cooled, and to find the changes in bacterial flora when the milk containing CO_2 is stored at different temperatures, were planned, but it was not found possible to carry them out. In view of the unsatisfactory flavour of the milk in the preliminary experiment, further work was considered unimportant from the practical view point.

Conclusions.

(1) Milking direct into an atmosphere of carbon dioxide did not, within six hours, depress the proteolytic bacteria or encourage the preponderance of acid-forming types, when stored at approximately 70°F.

(2) It did, with one exception, produce a milk with lower bacterial count after six hours at 70° F., when compared with that milked direct into an atmosphere of air.

(3) An inhibitory effect on coliform types in milk may be a result of the atmosphere of carbon dioxide.

(4) The construction of the can makes it difficult to sterilise under practical working conditions.

(5) The milk even after aeration had a taint, which made it unpalatable.

(6) The general use of the can on farms in Queensland supplying milk to depots would be likely to result in an improved hygienic quality, but this advantage would be offset by deterioration in the milk flavour.

These findings are in agreement with those of S. Orla-Jensen (4), who found that such a large quantity of carbon dioxide was needed for effective prevention of bacterial growth that a disagreeable flavour resulted, and concluded that the favourable results obtained with the device of Jens Grand were probably due to extra care in sterilisation and handling of the apparatus.

Acknowledgments.

It is desired to acknowledge gratefully assistance in the carrying out of the experimental work from Peters Arctic Delicacy Co. for the cleaning and steaming of the cans and the provision of transport facilities; Chris. Gills, of Eagle Farm, for co-operation in obtaining milk samples, and for the milk supplied; Queensland Butter Board for the provision of storage and laboratory accommodation. Thanks are also due to Miss B. Shield for assistance in planning the experiments and for the statistical work on the bacteria counts.

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(2) Ibid. Jan., 1939.

(3) F. H. McDOWALL and A. K. R. McDOWELL, N.Z. Journ. Sci. and Tech. XVIII. 1937, p. 822.

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Some Agricultural Problems of the Lower Burdekin District.*

H. W. KERR.

THE average production of cane and sugar per acre for the Pioneer, Kalamia, and Inkerman mills during the past five seasons has been:—

Season.	Cane per Acre.	Sugar per Acre.
	Tons.	Tons.
1934	32·3	5·04
1935	22·0	3·48
1936	30·4	4·74
1937	31·5	4·95
1938	28·2 (Est.)	4·37 (Est.)

Though it must be admitted that the district owes its pre-eminence, in a large measure, to the bounteous endowment of nature in providing both a rich soil and an abundance of readily available irrigation water, the possibilities which this combination promises could not be realised were it not for the ingenuity and skill of the farmers of the area in overcoming the inevitable local problems of crop production. In these three mill areas it is virtually impossible to produce crops without recourse to irrigation, and this phase of sugar agriculture has been admirably developed on the Delta lands.

It is my purpose, at this time, to enumerate and discuss briefly certain of the major agricultural problems of the district, and to indicate where possible the lines along which their solution may be found.

Soils of the Burdekin Delta.

The cane soils of the area are alluvial in character, and are generally richly supplied with all the essential plant food materials excepting nitrogen. In texture they vary from sandy loams to heavy clays, though the majority might be classed as loams. As is frequently the case in areas where the river course has so frequently changed, the deposition of sediments has been effected in a very haphazard manner: hence we find sandy loams with clayey or sandy subsoils; clay with sandy or clay loam subsoils; and so on for all possible alternations of strata. This irregularity adds substantially to the problem of irrigation practice, in so far as it influences the rate of water absorption by the soil, and the freedom of sub-drainage in areas where the available water supply is somewhat rich in salt.

Although a mechanical analysis of a selection of these soils would show that they contain a predominance of silt and sand particles, and a relatively small proportion of clay, the last-named is generally in a highly dispersed and sticky state, and its properties bring with them special cultivation problems. Following irrigation, considerable difficulty is experienced in restoring the soil to a state of good tilth, and if cultivation be delayed unduly, the soil breaks up into intractable clods. The

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farmers of the area are at present devoting considerable attention towards the amelioration of this soil condition; one line of approach which has given very encouraging results is the application of moderate dressings of molasses, either to ratoon crops or to fallow land. In fact the apparently permanent benefits from the treatment are so widely appreciated that the demand for reasonably-priced molasses now exceeds the supply.

These experiences suggest that any practice designed to increase the organic matter content of the soil might effect similar results. Trash conservation is therefore urged, though the slow rate at which this material decomposes during the normal summer months, due to moisture deficiencies, is an objection. The rotting process could be accelerated by the aid of green manure crops. But the difficulty associated with the production of a heavy bean or pea crop, without recourse to irrigation, is a factor which prevents the more extensive exploitation of this excellent practice; but growers might discover that even this added effort and cost might well be repaid in the benefits obtained.

Though the Delta soils are normally not in need of liming to neutralise excessive acidity, the proximity of a fair quality earthy lime at a reasonable price has suggested the possibility of this material as an aid in soil improvement. The limited amount of available evidence indicates that this plan is worthy of more extensive trial. The benefits of liming in its influence on the physical condition of the soil have been recognised by farmers since early times; but whether any particular soil will be improved by such an application is best determined by actual trial. Dressings of gypsum might produce results, even where agricultural lime is not successful, but the cost of this material may be a drawback; but similar effects would follow the broadcasting of lime and flowers of sulphur at the one time. A field trial embodying lime, sulphur, and gypsum is at present being conducted by the Bureau on an area of land on the Home Hill side of the river. This block had been seriously affected in productivity by prolonged irrigation with water containing more than a safe limit of salt.

Quality of Irrigation Water.

A very extensive study of the irrigation waters of the area has been made by the Bureau during the past eight years. A review of the analyses was prepared recently by Cassidy [1]. He distinguished two major groups—(*a*) those containing little mineral matter, but with a definite amount of free alkali, and (*b*) more saline waters containing no free alkali. The waters of group (*a*) bear a close resemblance in composition to the flood waters of the Burdekin River, while those of the second group resemble "diluted" sea water; in close proximity to the ocean or tidal water, the contamination by sea water often renders the water totally unsuited for irrigation purposes.

The limit of salt concentration which might be considered safe for the purpose cannot be stated with exactitude. Firstly, no extensive studies with harmful waters have been possible, as farmers naturally refrain from the use of waters which are excessively salt; and, secondly, the concentration of salt which would cause trouble varies with the soil type. With free soil subdrainage and rather liberal applications of the water, a salt content in excess of 100 grains per gallon may be quite safely handled; whereas on a heavy soil type salt accumulation

may be serious with waters containing substantially less than this amount.

Fortunately, the canegrower is usually able to obtain access to a drift which yields good quality water, and perhaps the greatest value of the survey and "vigilance" tests conducted by the Bureau lies in the guidance they have provided to farmers seeking better water supplies.

Any soil treatment leading to an improvement in the physical conditions of the land would automatically lessen the dangers of salt accumulation, while the use of sulphate of ammonia in reasonable amounts as the source of nitrogen for the crop, will normally serve to neutralise the usual concentration of free alkali encountered. In certain extreme cases, however, more drastic corrective treatment may be necessary; moderate applications of sulphur could be expected to prove effective under these conditions.

Irrigation Methods.

The standard method of supplying water to date has been the furrow or semi-flood system. Where water is obtained at a reasonable cost, wastage of water has sometimes been accepted as a fair exchange for saving in costs of labour for water application. Furrow irrigation inevitably introduces the complication that the margin of the field at which the water enters must be excessively flooded, if the distant end of the furrows is to receive its adequate supply. Moreover, the poor grades which are the rule in the Burdekin Delta make it essential to "drive" a large volume of water through the field, and this tends to excessive flooding.

Not only might exception be taken to the wastage of water, but the influence of the mechanical action of running water on the soil structure, combined with the aggravated effects of impurities which it contains, are definitely deleterious to the maintenance of a favourable physical condition of the soil. Increasing the frequency of supply ditches, with the consequent shortening of water furrows should lead to an improvement in this regard: moreover any increase in labour costs would be offset at least in part by a saving in pumping costs, while water supplies would be conserved.

The Bureau has attempted to direct attention to the possibilities of spray irrigation, as offering scope for the elimination of many of the irrigation farmer's troubles, while effecting savings in water and cultivation costs. Recent trends favour the use of rather heavy gauge portable fluming, combined with an efficient sprinkler operating on low or medium pressures. Doubtless our delegate to the Louisiana Conference (Mr. N. J. King) can provide interesting overseas information along these lines, while it is worthy of note that a few of our own canegrowers who have experimented with spray systems during the past year have expressed themselves as satisfied with the prospects they offer.

Soil Plantfood Requirements.

I have already stated that the major soil plantfood deficiency of the area is in respect of nitrogen: this is a direct consequence of the natural organic matter (humus) deficiency of the soils generally. The Bureau has conducted extensive trials to determine the most profitable applications of sulphate of ammonia for the Delta soils. Though top dressings applying 3 cwt. per acre are normally adequate for plant

cane, evidence is available which suggests that on some of the older lands, this amount might be increased with advantage. For ratoons, the optimum application is usually over 4 cwt. per acre, with more liberal dressings for soils which have been cultivated intensively for many years. One of the several virtues attributable to an application of molasses is the nitrogen supply which it adds to the soil; and after a reasonable dressing (6—8 tons per acre), the amount of sulphate of ammonia necessary may not exceed 2 cwt per acre. The advice regarding green manuring is further supported by this natural nitrogen deficiency, and where a heavy leguminous crop has been turned under prior to planting the cane crop, the sulphate of ammonia top dressings could be reduced, if not withheld entirely.

Farmers of the area are advised always to employ a moderate drill application of a planting mixture in order to preserve the natural supply of phosphate and potash in the land, and to guard against any possible deficiency from this cause: the applications need not, in general, exceed 2—3 cwt. per acre.

Certain growers who have been able to effect substantial crop yield increases due to the employment of more suitable manures, are frequently faced with a disconcerting drop in the C.C.S. of the crop. This may be due in part to over-treatment with nitrogen, and reduced applications of sulphate of ammonia might be tried to advantage. Forced early growth, combined with a tapering off of water application as the autumn approaches, should also prove helpful, while the consistent use of planting mixtures with a reasonable potash content will tend to accelerate maturity.

Ratooning Problems.

It is not many years since the practice of ratooning was virtually dropped from the programme of farmers on the older lands of the district. It is pleasing to note that the combined studies of the farmers and the Bureau have led to the discovery of at least some of the reasons why ratoon crops previously failed. The problem involved in getting an early application of water to the stubble, so that an adequate dressing of sulphate of ammonia could be made available for use by the young crop, is one of the most important reasons for many past failures. Doubtless the system will always involve difficulties so long as hilling-up is practised, and farmers consider this essential with the present irrigation methods. Ridging in this manner gives trouble in getting water to the stubble, while it also tends to "bring the stools to the surface."

Obviously the level cultivation methods which could be restored with spray irrigation stresses a further point in favour of this system. The adoption of methods for permanently improving the physical conditions of the land could also be expected to provide more favourable conditions for better and continued ratoon cropping. Trash conservation, by rolling into alternate interspaces, might enable this material to be saved, and also lead to economy in water consumption by ratoons: we have employed this method successfully in the Bundaberg area.

Cane Varieties, Pests and Disease Control.

While it may rightly be claimed that the district would benefit from an infusion of new cane varieties, with special properties, it must be admitted that the present standard varieties are well suited to the district. Canes of the P.O.J. type, with growth and ratooning vigour,

would be assets to the districts; but it has been found necessary to exclude the best of these due to their high susceptibility to downy mildew disease. In an attempt to eliminate this disease, variety B.208 was disapproved a few years ago. Had the growers of the area co-operated to a man in the removal of this variety from cultivation, and adhered rigidly to approved canes only, it would have been possible to re-introduce B.208 and probably certain P.O.J. varieties also during 1939. Unfortunately, diseased areas of B. 208 still exist in the district, while plantings of S.J. 16 (in ignorance, it is admitted) have also served to perpetuate the disease in the area. Those who appreciate the worth of B. 208 realise only too well what this means to them.

At the present time, a suitable early maturing cane is necessary to replace Clark's Seedling, which gives usually only a medium tonnage yield, and is often badly affected with sour rots. The Bureau-bred Q. 20 (a seedling of Badila) shows promise in this respect, and a plot of the variety was established in the district last year. At Mackay it has shown phenomenal C.C.S. values, and it possesses reasonably good ratooning qualities. Yield plots will be set out this year, and if it retains its promise, the cane will be distributed in 1940.

Small plots of other promising canes are also in the area, while the better seedlings raised in other centres will be brought to the Burdekin district for trial as soon as possible. This area is particularly fortunate in that it has escaped the major cane diseases of Queensland, and it is worth while holding up the introduction of new canes for a year or two, if in so doing we can then be certain that all risks of disease introduction are avoided.

The major pest of the district is the greyback grub, which assumes serious proportions from time to time in certain localities. There would appear little danger of this ever becoming a district-wide pest, as conditions generally do not favour its existence. But for those farmers who suffer losses every year from the pest, we feel that the recently adopted policy of subsidised fumigation provides the best means of keeping the pest in check, while saving the infested crop. Giant toads have been liberated also, but it will be some time before their true value in pest control can be gauged.

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The Introduction of Sugar-cane Varieties from Overseas Countries.*

ARTHUR F. BELL.

THERE are no varieties of sugar-cane native to Australia, and our sugar industry has been built up entirely on imported canes. From first to last something of the order of one thousand varieties have been imported into Australia, although this figure certainly includes many duplications. The bulk of these have comprised inferior "chewing-cane" varieties collected by various expeditions to New Guinea and which were soon discarded.

Since Australia had no native sugar-canes, it had, of course, no native diseases which are purely sugar-cane diseases. This is a fact which is well always to bear in mind, viz., that our imposing array of serious sugar-cane diseases has also been imported from abroad. These diseases were *all* introduced into the country per medium of cuttings taken from diseased plants, although doubtless these plants appeared disease-free to the untrained eye of the exporter; one cannot imagine that diseased cane was either deliberately or knowingly introduced in any one case.

The early importation of varieties was a happy-go-lucky affair; one wrote to a friend or relative somewhere abroad and a parcel of cane returned without let or hinderance by the next mail. Gradually, however, it became obvious to authorities that this was a very dangerous practice inasmuch as cane diseases were being spread by this means from country to country. The result was that in several countries the importation of foreign varieties was prohibited unless the imported varieties were subjected for a period to rigid quarantine conditions. Such countries, Hawaii for example, have their reward in a comparative freedom from major diseases which they have maintained to this day.

Unfortunately, Australia was very slow to move in this respect and we have the inevitable heritage in the greatest, and thus the worst collection of sugar-cane diseases ever assembled on this earth. Nevertheless, all is not entirely lost and the stable gate may yet be shut wtih advantage. The parasites which cause plant diseases frequently exist in several strains, and these strains do not attack all varieties of the one plant alike. Therefore, although we may have a particular disease present in this country it does not follow that we have all possible strains of that disease.

Most of you will have some recollection of the parlous conditions to which mosaic disease reduced the sugar industry in Louisiana some twelve to fifteen years ago when production dropped from 250,000 tons of sugar to 50,000 tons. Now in Louisiana there are at least six different strains of mosaic; a variety which is immune to one strain may be very susceptible to another, or it may even be resistant to five strains, but

* Address given to Conferences of Sugar Organisations, Brisbane, March, 1939.

very susceptible to the sixth, and so the problem of getting varieties resistant to the whole six strains is made very difficult.

We do not have these six strains of mosaic disease in Queensland, and hence it follows that it would be very unwise to import any cane varieties from Louisiana and plant them direct into the field, without first growing them in quarantine to ensure that they are free from any foreign strains of this disease.

In short, although we have mosaic disease in this country we have not all the available brands. And so it goes for other diseases. I hope, therefore, that I may have convinced you of the necessity for continuing to maintain strict control over variety importation and the absolute necessity for adequate quarantine facilities for the treatment of foreign varieties when they are imported.

Quite a number of canegrowers appear to harbour the belief that the present administration of the Bureau is inimical to the importation of varieties. It is now some ten years since the Bureau was reorganised, and therefore it is of interest to compare the importations made during this period with those made during the previous decade; when this is done we find that during the period 1928-1938 one hundred and five varieties were introduced directly into Queensland from overseas, as compared with forty-five for the 1918-1928 decade. In addition, during 1928-1938 some dozens of seedlings, raised by the C.S.R. Company in New South Wales, have been brought across the border, as well as a considerable number of foreign varieties introduced by that company and which were not duplicated by our own overseas importations. Furthermore in 1929, we had placed at our disposal a duplicate set of over one hundred varieties collected by an American Sugar Cane Expedition which visited New Guinea by aeroplane in 1928-9.

It will have become obvious that 1928-1938, so far from witnessing a slowing down in variety importation, has actually been a period of increased activity. It is true, of course, that these later importations have been done more unobtrusively. In days gone by varieties were brought into the country, rapidly propagated in a convenient cane district, and then distributed far and wide without further ado; nowadays, after passing through the required period of growth in quarantine, they are put in disease-resistance trials and the majority fall at this hurdle (as, indeed, we might expect they would since they were not bred and selected for resistance to our diseases). Of these varieties, of course, you hear nothing; but you are also saved the expense of finding they are disease susceptible *after* you have planted a big acreage.

The choice of the actual varieties which are to be imported from any one country presents a difficult problem. In making the selection one must, of course, be guided by the parentage of the variety and its possible or known resistance to any diseases present in Australia; we must also consider fibre content, sugar content, time of maturity, habit of growth, and its performance under conditions which might be similar to those obtaining in one part or other of the Queensland cane belt. In making any such selection a personal visit to the country in question is of very great assistance, of course, and periodic visits by Bureau

officers should perhaps be considered a necessity from this standpoint. Furthermore, in the absence of personal visits we must rely upon published reports and these, of course, are always delayed.

In recent months, several Queensland technologists have visited Hawaii and two agricultural men have suggested a few seedling canes which they consider it desirable to import into Queensland. Actually the leading one of these varieties was imported into Queensland some twelve months ago and will go to disease trials next Spring; the others have been requested from the H.S.P.A. Incidentally, some extravagant claims seem to have been made for some of these varieties by persons who have not seen them. We have heard from several quarters that there are available in Hawaii some six or eight varieties which are greatly outyielding P.O.J. 2878, and it is at times inferred that the development of the sugar industry in Southern Queensland is being retarded by the fact that these canes have not been introduced here—as a result presumably of indifference on the part of the Bureau. Such ideas are not only wrong, they are silly. All that can be claimed for such varieties at present is that their performance in Hawaii justifies their importation and trial here. How they would perform under the different conditions prevailing in Queensland, and particularly in the presence of a different disease complex, is an entirely unknown quantity. On the irrigated plantations of Hawaii H. 109 is a long way ahead of P.O.J. 2878, but we know from past experience that that proves *just exactly nothing* regarding its performance in Southern Queensland, where it was rejected many years ago. In fact this variety has never been worth a second look anywhere in Queensland. S.J. 4 is a much better cane than P.O.J. 2878 in the North, but we all know that S.J. 4 was a dismal failure in the South. And so we might go on *ad infinitum*. It is rarely that a successful imported cane was of much consequence in the country of its origin.

No one in Mauritius appears to have heard of 1900 Seedling, and D. 1135 and B. 208 were never grown to an appreciable extent in Demerara and the West Indies. Badila, our Queensland wonder cane, is pretty well useless anywhere else; P.O.J. 2725; the standard cane of Formosa, was never grown commercially in Java. Indeed the only seedling which I can call to mind as being prominent in its own country and abroad is P.O.J. 2878, and it is of interest to observe that P.O.J. 2878 remained the leading variety of Java for only about five years.

And after all is not this failure to duplicate yields exactly what we should expect? A leading variety in any one country is a leading variety simply because it dovetails into the conditions peculiar to that country. If it is taken elsewhere the balance is upset and mediocre yields result.

In regard to the future, it would appear inevitable that we must rely much more upon locally-raised seedlings than has been the case in the past. Two factors make it likely that the importation of suitable varieties from overseas will be much more difficult than it has been. In the first place, the long period of economic depression has brought about the suspension of activities of a number of cane-breeding stations and the restriction of activity in others. In the second place, the modern surge of "Economic Nationalism" has not passed the sugar world by and we find an increasing number of countries either prohibiting variety exportation entirely or else greatly restricting it. If country

"A" finds its export market to country "B" greatly restricted by increased production in "B" brought about by the growth of a seedling bred in "A," it is natural that the contributors to experiment station funds in country "A" should not be keen in further exportation of varieties. Moreover, certain countries have never gone to the expense of establishing extensive cane-breeding facilities, but have relied upon the productions of their neighbours. And, naturally, this has not tended to develop the best possible international feeling.

Therefore, while we will endeavour to obtain as wide a selection of varieties as possible, on a reciprocal basis, it cannot be expected that the range will be as extensive as heretofore.

THE ELIMINATION OF GUMMING SUSCEPTIBLE CANE VARIETIES IN THE BUNDABERG DISTRICT.

In the lists of varieties approved for planting in Queensland during 1939 it will have been noted that a number of old varieties, notably D. 1135 and 1900 Seedling, have been omitted from the lists of all Bundaberg mills. It is thought that the farmers concerned would welcome an explanation of the reasons for this step.

As is well known, the diseases downy mildew and Fiji, but particularly downy mildew, are causing a great deal of concern in the Bundaberg district. The two leading canes, P.O.J. 2878 and P.O.J. 213, are both highly susceptible to downy mildew, while P.O.J. 2878, 2725 (and all other high-numbered P.O.J. canes) are highly susceptible to Fiji disease.

The situation, then, boils down to this. It is possible that the spread of downy mildew and Fiji disease may force us to discontinue the cultivation of the present standards, and we will then be faced with the very serious problem of what varieties to substitute.

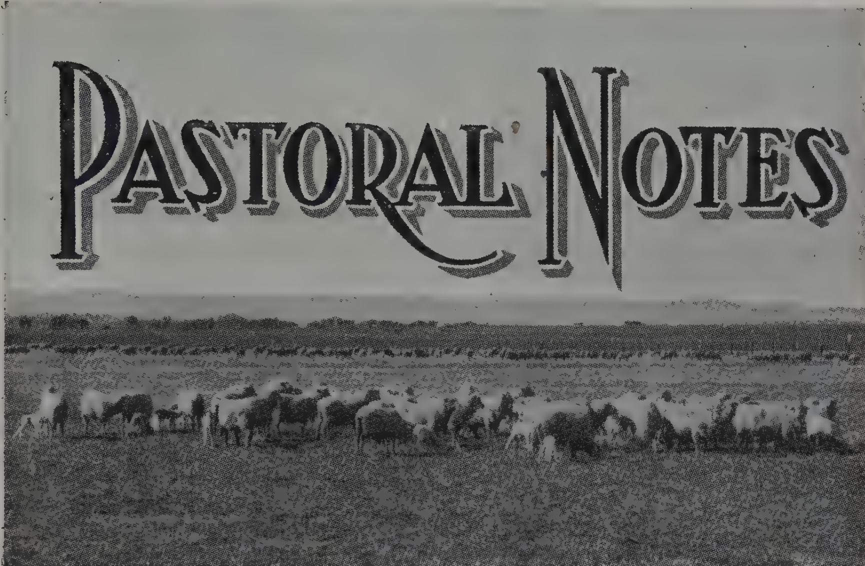
At the present time, of course, we cannot consider the release of any varieties which are at all susceptible to gumming disease, as their survival would be very short-lived. If, however, we can eliminate from culture *all* stools of the old gumming-susceptible varieties we could then start off with a clean sheet and the standard of resistance required in respect of gumming disease could then be greatly reduced and varieties which would otherwise be discarded could then be retained.

The policy then is to make a serious effort to clear out gumming disease from the southern areas, and at present the only susceptible variety left on the Bundaberg lists is Mahona for restricted plantings in frosty areas.

If, then, we later have to beat a retreat in the face of downy mildew and Fiji diseases, it will be of great assistance if we can be assured that gumming disease has been eradicated from the district, and we need not further seriously consider this factor when choosing alternative varieties.

It is, of course, greatly to be hoped that it will not be necessary to abandon the P.O.J. canes. It would not be necessary if all farmers took reasonable care both in the selection of their plants and in the inspection of their crops.

—A.F.B., in "The Cane Growers' Quarterly Bulletin."



Difficult Parturition.

W. DIXON, District Inspector of Stock.

WHEN calving becomes imminent, the cow leaves the herd and seeks a quiet spot. There she will become restless—getting up and lying down—and show evident signs of pain.

As labour advances the back is arched, the hindquarters are drooped, and straining becomes violent and continuous. Meanwhile blood may appear on the vulva and tail, and the waterbags protrude between the lips of the vulva. They increase rapidly and the feet of the calf may be seen within them.

The waterbags furnish a soft uniform pressure for the preliminary distention of the womb and passages, and prepare the way for the delivery of the calf. In normal presentations, it is wrong to break these bags prematurely.

When the cow calves standing up, the navel string breaks when the calf falls to the ground; but, when she calves lying down, the string is broken when she rises. A few hours after calving normally, after-pains commence and the placenta or afterbirth is expelled. If this is not expelled within twenty-four hours, it should be removed by careful traction. A good method is to take two sticks about two feet long, between which the end of the afterbirth is grasped, and rotated around them until close to the vulva, when gentle traction is applied, from side to side, and backwards and downwards, care being taken not to break it. A vaginal douche of boiled water at blood heat, to which has been added a mild antiseptic, should be given. A cheap and efficient outfit for this purpose consists of about 4 feet of $\frac{1}{2}$-inch rubber hose and an ordinary funnel. The end of the hose should have its edge pared off

with a sharp knife, and, after having been smeared with carbolic vaseline, it is introduced into the vagina, and gently pressed forward as far as the womb. The funnel is then placed in the other end of the hose and held above the cow's back, the douche being poured into it.

It is well, at all times, to allow nature to do its work without interference; but, when calving is protracted, and progress is not being made, a careful examination is necessary.

The operator should wear a clean sleeveless shirt, and his arm should be smeared with carbolised vaseline, or an antiseptic oil. This protects the arm from poisoning and the cow from the introduction of infective material into the passage.

The hand should now be introduced into the vagina and a careful examination made. It may be found that (1) the waterbags have burst, and that neither the feet nor head of the calf are presented, or that there is a presentation of (2) one fore foot and head; (3) both fore feet, and head back; (4) head with both fore feet back; (5) one hind foot without the other; or (6) other abnormal presentation.

Whatever part is presented should first be secured by a rope with running noose, so that it will not be lost during subsequent manipulation, and may be readily brought into position when the missing parts are found. If the cow is standing, her head should be turned downhill so that the fœtus and abdominal organs lie forward to give more room to bring up the missing head or limb. If lying down, she should be turned over on to the side opposite to that on which the limb is missing. When the missing part is located, no attempt should be made to bring it up during a labour pain, but after the pain has ceased, an effort should be made to secure it before the next pain comes on.

If the pains are continuous and violent, they may be checked by putting a tight surcingle round the body in front of the udder. If it is found that the passages are dry, pure olive oil may be run into the womb through a rubber tube. If the head is back, the limbs which are presented should be first secured with a rope having a running noose, then the fœtus should be pushed as far back as possible and an attempt made to secure the head with a noose or hook, and to bring it up into the passage. Having brought the limbs and head into a suitable position, traction should now be applied in a downward and backward direction, but only when the cow is straining.

Pulling when the cow is not straining should not be attempted. Patience and care are necessary. The extraordinary practice of attaching a draught horse or motor car to the fœtus and pulling it out by sheer force is not only cruel, but usually results in the death of both the cow and the calf. After a protracted calving the cow will be exhausted, and she should be provided with a warm rug and bed, also a few bottles of warm gruel.

Points to remember are:—

Do not interfere too soon.

When interference is necessary, exercise patience and take time.

Do not use force until the fore feet and head or the hind feet are secured in position.

Remember to pull only when the cow is straining.

TRUCKING YARDS.

Some bruising of stock occurs in the trucking yards, and it is quite commonly held that this is unavoidable. Suitable design of yards and races and quieter working of stock are the answers to this fallacy.

In moving cattle from yard to yard or pen to pen, there is some congestion just before, during, and just after passing gate or race. It is obvious that at such places rails should be flush with the posts and padding used where the fence makes sharp angles. It is equally obvious that working must be very steady to avoid jamming and, consequently, bruising—more particularly with the outside beasts. To prevent undue crushing at the approach, it is best to have the fences funnel- or V-shaped. If the wings are long and the gate wide the working is not slowed up and the number that can pass through is regulated well back, so that a jam does not occur at the actual place of passage. After passing through, there should be no obstructions to prevent fanning out. For this reason, a straight fence forming a side of two yards is not desirable when a corner gate is used.

When working cattle through one yard to another, gates should be opposite each other—i.e., in a direct line with the direction in which the beasts are streaming. The wings to a crush should both converge. It is bad practice to have one wing in a direct line with one side of the crush. This is often the case when an existing fence is used for one wing. As cattle work better uphill, the loading-out race or crush should be slightly inclined upwards to the truck.

DRUG TREATMENT FOR REDWATER.

There are two kinds of redwater in Queensland. Both are caused by minute blood parasites and are carried by the tick. The differences between these two organisms are so small that they can only be recognised under the microscope. It is impossible to determine which type of redwater is present by an examination of an animal in the field. Fortunately, this is not necessary.

During the last few years intensive efforts have been made to find a suitable drug which would be effective in treatment and yet easy to apply. For many years piroblue held favour. This is effective in the treatment of one kind of redwater, but is ineffective against the other. Unfortunately, the common form in Queensland is unaffected by piroblue. Moreover, piroblue has a great disadvantage in that it requires to be used intravenously—i.e., it must be inoculated into the jugular vein.

Acaprin is now used largely in the treatment of redwater outbreaks, and is known to be effective against both forms of the disease. It is easily applied because the dose is small and it can be injected subcutaneously—under the skin. Supplies of the drug are kept on hand at the Department of Agriculture and Stock and by leading chemists. It is put up in the form of a solution and in single doses.

In areas where redwater is common, owners should keep a few doses of the drug on hand, together with a small hypodermic syringe.

Cases should, of course, be treated as early as possible, but even those which look hopeless at the start will, within an hour or two, show improvement, and so go on to recovery. A second injection can also be given without harming the animal in any way.

SHEEP DRENCHING.

Reports have been received from sheepowners at various times of ill-effects following the use of the nicotine sulphate and bluestone drench, which is advised for the removal of hair worms from sheep. This drench is perfectly safe providing the sheepowner knows when and how to use it. Where it is followed by ill-effects these are usually due to:—

1. *Careless Mixing.*—Nicotine sulphate is a highly poisonous drug, therefore the mixing of the drench should be given every care. The nicotine sulphate is measured in fluid ounces and not in ounces weight.

2. *Careless Administration.*—The majority of ill-effects which have followed the used of this drench are due to careless administration. The dose given depends not only upon the age, but also upon the condition of the sheep. The recommended doses are for sheep of various ages in fair to good condition. If the condition of the sheep is low, the dose should be reduced about one-fourth.

   If the drenching is hurried, a portion of the fluid may enter the lungs of the animal with fatal results. It requires only a very small quantity of nicotine sulphate to kill a sheep should it reach the lungs. In hurried drenching, which is most frequently the case where automatic drenching guns are used, the tissues of the mouth and throat may become cut or bruised. The nicotine sulphate is rapidly absorbed through these wounds with frequently disastrous results.

While the nicotine sulphate and bluestone drench is highly effective against stomach worm, it should not be employed where a heavy stomach worm infestation is present. Under such circumstances this drench becomes dangerous as it may be rapidly absorbed into the body.

In sheep which are suffering from stomach worms, bluestone alone should be used.

It is always wise before drenching a flock to find out which species of worm is responsible. This can be readily determined by killing and examining one of the most affected sheep.

A HORN-TIPPING TIP.

Much time and energy is often wasted in the practice of tipping the horns of cattle. Some owners of stock are slipshod in their methods of removing the points of horns. In doing the job, care should be taken to ensure that the cut does not slant. Oblique or slanting saw cuts defeat the object of the operation, for, although the tips are removed, sharp, chisel-like edges remain on the horns, leaving an animal still capable of inflicting a nasty injury to another. Even when cut squarely across, tipped horns remain capable of causing severe bruises. Horns with chisel-shaped points are a menace to all other animals within reach of their possessor, and consequently a probable cause of reduced profit to the stockowner.

—*S. C. O. Jessop.*

A CRUSH FOR CATTLE AND HORSES.

A crush for holding cattle or horses should be built on every farm. It costs little and occupies a small area; yet it saves much time and labour when full-grown stock are to be dehorned, branded, castrated, speyed, drenched, or otherwise treated. For these operations, the animal should be held in a position which allows of no movement.

The ordinary crush can be arranged to accommodate large or small animals. A series of auger holes ($\frac{1}{2}$ inch diameter) are bored about 6 inches apart along two rails of convenient height on each side of the crush. The holes should be deep enough to seat a bolt or iron pin firmly. The bolt or pin should stand 4 to 6 inches above the rail. These pins—one on each side—serve as chocks against which a cross rail may be placed. By working the animal right to the front of the crush, the pins and rails may be arranged to prevent any "backing." In a similar way the width of the crush may be adjusted to prevent lateral movement.

To secure the head of the animal, the "A" shaped bail-type of structure may be made from a double cross rail between which slide vertical poles attached to the base of the crush posts by stout hinges. With such a crush, many farm operations usually requiring four men can be done quickly and efficiently by a man and boy.

"LUMPY JAW" OF CATTLE.

Actinomycosis, "lumpy jaw" or "wooden tongue," is a common disease of cattle. There are two forms of the disease, indicated by the foregoing terms, one of which attacks the bones of the jaw and the other the tongue. Strangely enough, each form is caused by a different type of organism.

These organisms are found on the grass, and infection probably takes place through a small injury to the gums. From there they penetrate the tongue or the jawbone, as the case may be.

Advanced cases are easily recognised by the stockowner. In one form, the tongue is increased in size and may be so large as to project out of the mouth. It is very hard to the touch—hence the term wooden. When the jaw is attacked there is often considerable swelling and pus formation. The pus works its way to the exterior, and openings are produced through which the pus flows. Extension of the process leads to the formation of several openings and the jaw may, as a result of the formation of new bone tissue and inflammatory swelling, grow to an enormous size.

Bad cases, whether of the tongue or jaw form, lead to emaciation of the animal because of the difficulty in taking food. Owners are not advised to attempt treatment of bad cases. It is better to destroy the animals, as they may cause infection of other stock.

In the case of valuable animals, if the disease is not too far advanced, treatment may be possible, and owners are asked accordingly to get in touch with the Animal Health Station, Yeerongpilly.

CLASSING THE EWE FLOCK.

Many grazing properties in Queensland are now stocked well up to their carrying capacity, and, with the coming crop of lambs to be provided for, some reduction in numbers will be necessary. It is more profitable to own a flock of good ewes than a flock containing a mixture of good and bad stock. Besides being more profitable, it should give the owner far more satisfaction to have a flock as near as possible to uniformity in type and which will cut a heavy fleece of good quality wool.

On most large holdings, classing the ewe flock forms part of the station routine, and there is no reason why smaller flocks should not be classed in the same way.

Just before shearing is the most suitable time to do the classing and, usually, the flock can be classed in three groups to advantage. The tops should consist of all the large-framed deep-bodied ewes carrying a covering of even type, well grown, and showing the character and colour typical of the breed. Ewes selected for the main flock should be as free from fault as possible, but need not be so even or up to the standard of the tops. The third class will be the culls, including light cutters, ewes producing inferior wools in quality or colour and ewes rejected for defective frames, weak constitution, or objectionable folds or wrinkles. The rams to be mated with them should be classed in the same way, the best being selected for the top line. All culled ewes should be fattened, and sold as soon as possible; the same may be said of those cast for age.

—*Jas. Carew.*

CARE OF THE DIP.

Cattle owners in ticky country often neglect their dipping vats. Consequently, they lose money without realising it, for cattle dipped recently in a dirty vat lose their bright, clean appearance, which helps the seller when the bidding in the sale ring is brisk.

In the course of time, a dipping vat will accumulate a considerable quantity of filth which settles slowly on the bottom as a deposit of sludge. It may become so bad that an owner is forced to empty the vat, and is then put to the expense of recharging.

This can be avoided by cleaning the vat periodically. For this purpose, a kerosene tin is cut in half diagonally to make a scoop, which is attached to a handle with wire. Small holes are cut in the bottom and sides. After dipping cattle, the surface of the fluid may be skimmed with the scoop and floating hair and dirt removed. This helps to keep the vat clean for a long time.

After dipping, the sump should also be cleaned and dirt prevented from accumulating.

A white mark should be placed on the side of the vat to show the height of the fluid. It will be noticed, particularly in hot weather, that evaporation is very rapid, and the surface of the fluid will fall far below this mark. Before next dipping, water can be added until the dipping fluid is again at the correct level. It is only the water that evaporates—not the concentrates.

—*Dr. John Legg.*

Care of Milking Machines.

M. J. GRIFFITHS, B.Sc. (Dairying), Dairy Laboratory.

MILKING machines, although they have revolutionised dairying methods, may, if mishandled or neglected, constitute one of the biggest menaces to milk and cream quality that the dairy farmer has to face. Many people hold the opinion that clean milk of good keeping quality and choice grade cream cannot be produced with a machine, but this has been investigated fully, and both research work and practical experience have proved that it is wrong. As good a quality of milk can be produced by machine as by hand, provided the correct procedure is followed in care and cleaning.

Another objection often brought forward is that the machine tends to increase udder trouble. This is, of course, true if the farmer fails to notice cases of infection as soon as they occur and allows diseased cows to be milked by the machine. The great importance of inspecting the foremilk for any abnormal appearance should be realised, and any cow showing signs of mastitis in the first-drawn streams should be milked out by hand and the milk isolated from that used for human consumption. Cows with sore teats should also be milked by hand, although the machine may safely be used if they are left until last. A machine is very unlikely to cause teat sores—in fact, one Queensland dairy farmer with a large herd has experienced complete freedom from them over six months since he started machine milking—but it is liable to transfer the infection if used subsequently, without sterilization, on other cows.

The solution of most milking machine troubles lies in proper cleaning and sterilizing after each milking. It is essential that cleaning should be done promptly after milking is completed before the milk solids have time to dry on the rubber parts, for once dry they are far more difficult to remove completely. The first machines were crude inventions made with ordinary rubber parts which were easily cracked and pitted by the action of fat and hot water, making them excellent breeding places for contaminating bacteria. Nowadays, the modern machines are solidly

built and the rubbers are of the very best quality resistant to high temperatures, so that they can safely be boiled and even sterilized regularly by steam, without injury.

The method of dealing with milking machines, using a weak solution of caustic soda in boiling water, is well adapted to Australian conditions, and has proved economical, rapid, and successful. This method is as follows:—

(1) One gallon of clean *cold* water is drawn through each set of teat cups by suction, lifting the unit up and down in a bucket of water to allow air to mix with it.

(2) The outsides of teat cups and rubber tubing are then washed and brushed in *warm* water and caustic soda.

(3) At least 1 gallon of *boiling* caustic soda solution is drawn through each separate set of teat cups, holding them so that all receive equal treatment.

(4) The solution is removed completely by drawing at least 2 gallons of *boiling* water through each set of cups.

(5) If steam is available, this is applied for five minutes to complete the sterilization.

Strength of Solution.—One teaspoonful of caustic soda added to every 4 gallons of boiling water is the correct amount and, provided this strength is not exceeded, no damage will be done to the machine, and satisfactory results will be obtained. Used carelessly, however, caustic soda is dangerous in its action, and care is needed in handling it and in making up the solution. The water used must be really boiling to achieve proper cleansing and sterilization, and by this treatment the resistance of the rubber parts to cracking is actually increased.

The vacuum line is often a source of trouble, and should receive a complete flushing once each day with boiling water, care being taken not to flood the pump. All taps should be left open when the machine is not in use, and the teat cups should be hung up in a cool, dust-free place. The use of chemicals other than in the washing process has been found to be unsatisfactory, and there is great danger of traces of them finding their way into the milk and cream and causing taints.

BUTTER AND CHEESE COMPETITIONS.

THE Downs Co-operative Dairy Association Ltd. won singular success in the Dairy Produce Show, conducted by the Australian Institute of Dairy Factory Managers and Secretaries at the Hamilton Cold Stores on 21st June.

The show was opened by the Acting Minister for Agriculture and Stock (Mr. D. A. Gledson), who announced the principal awards as follows:—

The grand aggregate competition for butter was won by the Downs Association factory at Toowoomba with 1,040½ points, with the Maryborough Association's factory at Kingaroy second with 1,030½ points, and the Warwick Association's factory, Allora, with 1,029½ points, third.

The P. and O. Line's championship for storage butter was also won by the Downs Association's Toowoomba factory with 286 points.

The Orient Line's continuous grading competition for export butter was won by the Toowoomba factory of the Downs Association with 94·04 points. The Maryborough Association's factory at Kingaroy was second with 93·65 points, and the Gympie factory of the Wide Bay Association third with 93·43 points.

The Downs Association's factory at Goombungee also won the competition for the greatest improvement with 48 points. The Cabooltture Association's Eumundi factory was second with 39 points, and the Gympie factory of the Wide Bay Association third with 28 points.

The moisture content competition was won by the South Burnett Association's factory at Proston with an average moisture content of 15·74. The Queensland Farmers' Association factory at Booval was second with an average of 15·68, and the Murgon factory of the South Burnett Association was third with an average of 15·63.

The Bestobell cup was won by Mr. R. W. Thomas, of the Downs Co-operative Association at Toowoomba. The Wyandotte trophy was won by Mr. S. Olsen of the Downs Association at Crow's Nest.

The champion cheese of the show was made by the Pittsworth Association's factory at Pittsworth, and was awarded 95½ points.

The grand aggregate competition was won by the Irongate Association at Irongate with 559 points. The Downs Association's factory at Westbrook was second with 558½ points, and the Pittsworth factory with 556½ points third.

COTTON-WOOL FILTER DISCS FOR STRAINING MILK.

Although the superiority of cotton-wool filter discs for straining milk has been stressed repeatedly, some dairy farmers continue to use muslin or cheesecloth for the purpose. The greater advantage of the filter disc, especially from the hygienic point of view, is that it is destroyed after every milking, while cloth strainers are usually used again and again. Muslin or cheesecloth, if washed and boiled twice daily and used by those who understand what is really meant by bacteriological cleanliness, may make fairly satisfactory strainers, but if not washed and boiled after every milking, cloth strainers may be a serious source of contamination—a fact only too plainly evident on visits to some dairy farms. Moreover, cloths are not as efficient as discs in removing the finer dirt from milk.

Every dairy farmer producing milk intended either for the retail trade or for cheese manufacture is strongly urged to use only cotton-wool filter discs for straining, as provided for in Regulation 39 of "*The Dairy Produce Acts,* 1920 *to* 1938." Most cheese factories now keep supplies for distribution to their suppliers; they also are obtainable from any dairy supply business at a reasonable price. The direct advantage of the use of cotton-wool filter discs would amply offset the small cost involved.

—*E. B. Rice.*

STRAINING, COOLING, AND STORAGE OF MILK AND CREAM.

Temperatures on the average farm present a difficult problem in summer, but good dairy management depends largely on their regulation and control. The removal of animal heat from milk and cream as soon as possible after milking or separating, followed by storage in cool surroundings, will greatly lengthen their useful life by delaying the growth and development of bacteria. Together with straining, which serves to remove the visible dirt and so reduce the numbers of micro-organisms, control of temperature forms a method whereby the farmer can definitely increase the value of his product.

Straining.—Cow-hairs, flies, dust, and dung particles and other foreign matter carry with them enormous numbers of bacteria, and should be kept out of milk by every possible means, for no amount of straining can remove bacteria once they have become free in the milk. Should some visible dirt gain entrance, however, the straining of each cow's milk through a cotton-wool disc immediately after milking will minimise the damage caused.

Straining should be done once only, and should take place before cooling or separating. The disc type strainer prescribed by the Dairy Regulations is preferable to any other, since each disc is discarded after use; provided that the metal parts are scrubbed and sterilised, there is no risk of recontaminating the milk as with a cloth which has not received thorough washing and boiling; also, the finer mesh of the wad will trap smaller particles than will a cloth. If a large quantity of sediment is being removed, the disc should be changed during milking.

Cooling.—Some form of cooling is necessary to counteract rapid bacterial development; and the most usual medium for the purpose is water. Adequate water is necessary for cooling, and if the supply is insufficiently cold an evaporating device or the use of ice may be required to bring the temperature of the cooled milk to 60 deg. F. or lower, and cream to 70 deg. F. or lower. If deep well water is available the maximum advantage in temperature can be obtained by pumping it direct to the cooler or trough when required. In the case of shallow well, surface, or tank water, some means of storing it, protected from the heat of the sun, must be devised if it is to be useful as a cooling agent.

An insulated tank, through which cold water flows, and in which cream cans may be placed, is a fairly satisfactory arrangement for reducing the temperature steadily with constant stirring, which also aerates the cream; the water is then run to a trough for watering stock.

For cooling and aerating milk, the best type of cooler is the endless corrugated type, which can be used in conjunction with a water-bag evaporator (filled after each cooling in preparation for the next), or with a fixed tank to which water is pumped and flows through the cooler by gravity, or with a refrigerating unit using brine. Such a cooler, having wide corrugations and no end plates, can be easily cleaned with a brush and has no awkward crevices. Porous cylindrical containers, large enough to hold a single can, working on the evaporation principle, are being used in some districts successfully, and have the advantage of being transportable and economical of water.

Refrigerating is a sure and certain way of improving quality, for, although it actually does not kill harmful bacteria, it renders them dormant and unable to cause deterioration of milk or cream. Many farmers are coming to the conclusion that the improvement in grade resulting from refrigerating their product on the farm makes it financially economical. Very little bacterial growth takes place below 45 deg. F., but the growth rate of the common milk types increases steadily above this, up to around 100 deg. F., and is, of course, favoured by summer conditions. During sultry weather especially extra care and precautions need to be taken with regard to cooling and cool storage of milk and cream.

Storage.—The Dairy Regulations provide for a suitable storage room (Dairy House A) for milk and cream, or for milk only a well-covered ventilated stand will suffice. A clean wet bag wrapped around a can will assist cool storage by insulation and by evaporation. Direct summer sunshine in Queensland has tremendous heating power, and the proper protection of cream left adjacent to the road awaiting the carrier is, therefore, also important. Thick timber roofing over the cream stand affords greater protection than galvanised iron, which is not permitted under the Dairy Regulations.

Careful temperature control right from the start is the key to safeguarding quality in either milk or cream production, for whatever purpose they may be required.

—*M. J. Griffiths.*

STERILIZATION OF DAIRY UTENSILS.

More bacteria are added to milk and cream from improperly washed and ineffectively sterilized utensils than from any other source. While the methods of washing on some farms are reasonably sound, the sterilization practised is frequently ineffective.

Steam sterilization is very satisfactory, but, unfortunately, it cannot be done on every farm.

Boiling water, however, can be made available in every dairy; and, if effectively used, will annihilate all but the most resistant micro-organisms. A common, but undesirable, practice is to obtain the boiling water from the kitchen stove. While the pouring of boiling water on utensils is to be commended in ordinary circumstances, the effectiveness of the sterilization is reduced considerably when the boiling water has to be removed from the kitchen to the dairy, with a consequent drop in temperature.

The best results are achieved by the provision of a boiler in the vicinity of the separator room or dairy house. For this purpose, a 12-gallon boiler has been stipulated under the Dairy Produce Acts. To obtain thorough sterilization, the utensils should be immersed in the boiling water for at least ten minutes.

The time and trouble taken by the farmer in the regular sterilization of his milk and cream utensils will be repaid amply in the consistently good grading and keeping quality of his product.

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Adler, Tinana	Nevertire ..	White Leghorns, Australorps, Rhode Island Reds, and Langshans
F. J. Akers, Eight Mile Plains	Elmsdale ..	White Leghorns and Australorps
E. J. Blake, Rosewood ..	Sunnyville ..	White Leghorns, Australorps, White Wyandottes and Rhode Island Reds
J. Cameron, Oxley Central ..	Cameron's ..	Australorps and White Leghorns
M. H. Campbell, Albany Creek, Aspley	Mahaca Poultry Farm and Hatchery	White Leghorns and Australorps
J. L. Carrick & Son, Manly road, Tingalpa	Craigard ..	White Leghorns
N. Cooper, Zillmere road, Zillmere	Graceville ..	White Leghorns
R. B. Corbett, Woombye ..	Labrena ..	White Leghorns and Australorps
T. G. Crawford, Stratford ..	Rho-Isled ..	Rhode Island Reds
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme ..	White Leghorns, Australorps, and Rhode Island Reds
Dixon Bros., Wondecla	Dixon Bros. ..	White Leghorns
Rev. E. Eckert, Head street, Laidley	Laidley ..	Australorps, White Leghorns, and Langshans
Elks & Sudlow, Beerwah ..	Woodlands ..	Australorps and White Leghorns
W. H. Gibson, Manly road, Tingalpa	Gibson's ..	White Leghorns and Australorps
Gisler Bros., Wynnum	Gisler Bros. ..	White Leghorns
G. Grice, Loch Lomond ..	Kiama	White Leghorns
J. W. Grice, Loch Lomond ..	Quarrington ..	White Leghorns
Mrs. M. Grillmeier, Mount View, Milman	Mountain View	Australorps, Minorcas, and Rhode Island Reds
C. & C. E. Gustafson, Tannymorel	Bellevue ..	Australorps, White Leghorns, and Rhode Island Reds
P. Haseman, Stanley terrace, Taringa	Black and White	Australorps and White Leghorns
C. Hodges, Kuraby	Kuraby ..	Anconas and White Leghorns
J. McCulloch, Whites road, Manly	Hindes Stud Poultry Farm	White Leghorns, Australorps, and Brown Leghorns
A. Malvine, junr., The Gap, Ashgrove	Alva ..	White Leghorns and Australorps
H. L. Marshall, Kenmore ..	Stonehenge ..	White Leghorns and Australorps

Name and Address.	Name of Hatchery.	Breeds Kept.
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White Leghorns, and Langshans
J. A. Miller, Racecourse road, Charters Towers	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	Australorps, Brown Leghorns, and White Leghorns
Mrs. H. I. Mottram, Ibis avenue, Deagon	Kenwood Electric Hatcheries	White Leghorns
J. W. Moule, Kureen	Kureen ..	White Leghorns and Australorps
D. J. Murphy, Marmor ..	Ferndale ..	White Leghorns, Brown Leghorns, Australorps, Silver Campines, and Light Sussex
S. V. Norup, Beaudesert Road, Cooper's Plains	Norup's ..	White Leghorns and Australorps
H. W. & C. E. E. Olsen, Marmor	Squaredeal Poultry Farm	White Leghorns, Australorps, Black Leghorns, Brown Leghorns, and Anconas
A. C. Pearce, Marlborough ..	Marlborough Stud Poultry Farm	Australorps, Rhode Island Reds, Light Sussex, White Wyandottes, Langshans, Khaki Campbell and Indian Runner Ducks, and Bronze Turkeys
E. K. Pennefather, Oxley Central	..	Australorps and White Leghorns
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farm	White Leghorns, Australorps, Langshans, Rhode Island Reds, and Brown Leghorns
G. R. Rawson, Mains Road, Sunnybank	Rawson's ..	Australorps
J. Richards, Atherton	Mount View Poultry Farm	White Leghorns and Australorps
H. K. Roach, Wyandra	Lum Burra ..	White Leghorns and Australorps
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
A. Smith, Beerwah	Endcliffe ..	White Leghorns and Australorps
T. Smith, Isis Junction	Fairview ..	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
A. J. Teitzel, West street, Aitkenville, Townsville	Teitzel's ..	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's Poultry Farm	White Leghorns and Australorps
W. A. Watson, Box 365, P.O., Cairns	Hillview ..	White Leghorns
G. A. C. Weaver, Herberton road, Atherton	Weaver's Stud Poultry Farm	Wyandottes, Indian Game, Barred Rocks, Australorps, White Leghorns, Anconas, Rhode Island Reds, Buff Orpingtons, Black Orpingtons, and Buff Leghorns.
T. Westerman, Handford road, Zillmere	Zillmere ..	Australorps and White Leghorns
P. A. Wright, Laidley ..	Chillowdeane ..	Brown Leghorns, White Leghorns and Australorps
R. H. Young, Box 18, P.O., Babinda	Reg. Young's ..	White Leghorns, Brown Leghorns and Australorps

NEW REGISTRATIONS.

Following is a list of those who have applied for the registration of their hatcheries up to the 26th June, 1939:—

Name and Address.	Name of Hatchery.	Breeds Kept.
R. H. & W. J. Bowles, North Rockhampton	Glenmore Poultry Farm and Hatchery	White Leghorns and Australorps
W. J. B. Foxwell, Coomera ..	Foxwell's ..	White Leghorns and Australorps

The Preservation of Concrete on the Farm.

CONCRETE floors and feeding troughs on the farm often show signs of wear soon after being laid down, a fault which is often due to the action of various acids in milk and some other foods. If the farmer does nothing to prevent further wear, the concrete becomes pitted and quickly breaks up.

This deterioration of the concrete may be delayed successfully by the correct use of a special type of silicate of soda, which is cheap and easy to apply. When mixed with water the solution thus obtained is sprinkled on the surface of the concrete to be treated, is absorbed, and combines with the concrete, forming a tough coating which is impervious to water and acids under ordinary farm conditions.

One gallon of the special silicate of soda is thoroughly mixed with 4 gallons of water. The 5 gallons of solution will suffice for three applications to an area of 300 square feet of average concrete. Very dry or porous concrete will require a fourth application.

In making new concrete floors, the work should be finished off so that the surface is not very smooth, otherwise the stock will be liable to slip when it becomes wet. When the concrete is firm and nearly dry the solution of silicate of soda in water is applied by means of a spray pump, a watering can with a fine sprinkler, or a mop. Do not flood the solution on, but apply just as much as the concrete can absorb readily. A second, and later a third, application of the solution should be made as the surface dries out each time. For new concrete three coats should be sufficient.

Worn floors and troughs may be renovated in the following way:—First, the surface should be thoroughly scrubbed with soap and hot water to remove grease and dirt. Then the area is coated over with a mixture of one part cement to three parts clean, fine sand. When the concrete is firm and drying, treat with the silicate of soda solution as for new concrete.

Floors and troughs in sound condition will benefit by treatment with silicate of soda. The surface should be freed from grease as before mentioned; four applications of solution will probably be necessary, and twenty-four hours after the last application any solution remaining on the surface should be removed with a mop.

Concrete floors and troughs treated in this way last longer, are easier to clean, and dry more quickly than untreated concrete. For best results, the concrete should receive a light treatment once each year following the initial treatment.

When purchasing silicate of soda for conditioning concrete, the purpose for which it is to be used should be definitely stated to ensure obtaining the correct material.

—*T. Abell.*

COUNTING SHEEP.

It may be taken as a fact that unless one is born with or has developed an aptitude for this work he will never make a first-class sheep counter.

There are many methods of counting. The novice will try and count them singly as they come—one, two, three, four, and so on. This is a very slow process, and the gate has to be very narrow if an accurate tally is to be obtained.

Some count in twos—two, four, six, eight, and so on. This again is slow where big flocks have to be dealt with, and the sheep would be better on grass than in the break.

A successful method is to count in groups of three, one up to thirty-three, and let a single sheep go and tally 100.

It is astonishing to observe the speed and correctness of two good counters, one giving delivery and the other taking delivery.

It is a rare thing when two good men are engaged to see a check count, and this applies where thousands of sheep have to be correctly tallied. Constant practice is necessary to keep in form. To this cause may be attributed the fact that many drovers excel in counting sheep.

—*J. L. Hodge.*

DIET AND NATIONAL EFFICIENCY.

Australians are becoming nutrition-conscious and, in this respect, are merely keeping step with the peoples of other countries of the world, for every nation is seeking a solution to the pressing problem of raising nutritional standards.

Great Britain has given considerable attention to the nutrition problem, and is attempting to develop better nutrition habits among her people.

France has revolutionised her diet completely since the Great War. The consumption of bread has shrunk to less than half what it used to be, and there has been a corresponding increase in the amounts of milk, butter, cheese, fresh fruit, and vegetables eaten. With this change in diet has come an improvement in national physique and prolongation of life.

Other countries of Europe and America, also, are attacking problems of nutrition in practical ways.

A recent statement of the Queensland Nutrition Council concludes with these words of warning:—"Let us realise that the vital factor in any scheme of defence is the healthy individual. Even the largest gun is but a tool which must be manned. The wellbeing of individuals, and therefore nutrition, is paramount during peace or war!"

DODDER IN LUCERNE SEED.

Lucerne is grown from seed and is usually sown with the object of providing a stand for several years. With this in mind, only the best seed should be bought with an assurance that it is free from dodder.

Dodder is an annual parasitical plant found in the warmer parts of the world. Its seed germinates in the soil, sends up a stem and attaches itself to the host plant, which, in Queensland, is mostly lucerne. It is leafless, with twining thread-like stems, which attach themselves to the host plant by means of tubercles; from then onwards the parasite draws its nourishment from this source and severs its connection with the soil. The immediate effect is that the host plant is called on to support not only itself but also the dodder until ultimately the exhausted plant dieds, in most cases smothered in a tangled mass of light brown threads. Dodder produces seed quickly, so that it can run the full life cycle (seed to seed) before the host plant dies from starvation. Dodder seeds are borne in a globular capsule with four seeds in each. These seeds are pressed together, giving them their characteristic flattened surfaces.

Unfortunately, this parasitical growth is common in lucerne fields. Experience shows that the dodder seeds cannot be removed satisfactorily from lucerne seed with cleaning machinery, or by sieving; this statement is based on many unsuccessful attempts to make saleable dodder-infested lucerne seed.

Growers of lucerne seed, in fairness to themselves as well as to those who may buy their seed, *should never harvest seed from a dodder-infested field.*

It should be borne in mind that any seed for sowing, or any material found to be dodder-infested, is subject to immediate seizure, and the person offering infested seed for sale is liable to prosecution. A £50 fine is provided for the sale of lucerne seed containing dodder. No excuse can be accepted for the presence in seed or feed of such a destructive parasite, which can well be considered as lucerne's worst enemy.

Buyers should always insist on an assurance that the seed they are purchasing is dodder-free.

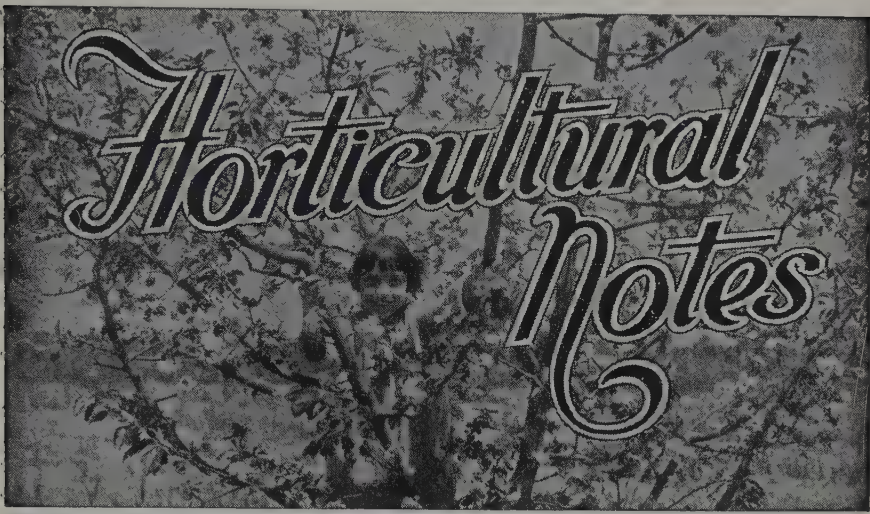
Samples of lucerne seed representing seeds purchased by farmers for their own sowing are examined free of charge, at the Seed Testing Station, Department of Agriculture and Stock, Brisbane. Samples should be of not less weight than 4 oz., and marked as follows:—

Sample of............seed drawn from............bags representing a total of............bags marked............
Purchased from............of............on............

Name and address of sender, and date.

It is better to send a sample for examination as soon as it is purchased, rather than wait until the crop has grown, and then find it contains injurious weeds.

—*F. B. Coleman.*



Preparing for and Planting Citrus Trees.

R. L. PREST, Instructor in Fruit Culture.

THE selection of the orchard site is of great importance. Citrus trees thrive in a frost-free, well-sheltered, warm situation. In districts where the prevailing winds are likely to interfere with the normal tree growth, belts of standing timber or scrub should be retained as a protection to the orchard. In inland areas, where timber is scarce, shelter-belts should be planted.

The site should be an area of unbroken, nearly level or gently sloping land. Steep hillsides should be avoided, for, in addition to the risk of irreparable losses by soil erosion, the costs of general orchard practice are high. Most places along the coast are free from damaging frosts. In the Burnett district, however, low temperatures have occurred on occasions, causing injury to young citrus trees. In such districts, hollows and low areas, where frosts are likely to be experienced, should be avoided as sites for citrus orchards.

The first essential in planting an orchard is to plough the land thoroughly and subsoil it, always, however, taking care that the subsoil is not brought to the surface. This can be done by ploughing a furrow in the usual way, followed by a subsoiler to loosen up the bottom of the furrow before the next sod is turned. Ploughing should be followed by harrowing, working down, and grading.

Citrus trees require plenty of room for growth and cultivation. The mistake of close planting has generally been a common one. In the drier areas where the application of water can be controlled, plantings should be made at least 30 feet apart. This distance, of course, can be varied according to soil and climatic conditions, but it should never be less than 25 feet.

To ensure the young trees being placed exactly in the position occupied by their place pegs, a planting board will be found useful and is easily constructed. A board some 4 or 5 feet in length, 4 or 5 inches in width, and 1 inch thick is used, and a "V" notch is cut in the middle of one side and of each end. The centre notch is placed against the peg denoting the position of the tree, and pegs are driven in at the notches at either end of the board. The board and the tree peg are then removed, leaving the latter two pegs in place.

The hole to receive the tree is next dug, the board being again brought into use, and fixed, as before, at the ordinary soil level between the two remaining pegs. The tree is placed in the hole at the centre notch in the board, taking the position formerly occupied by the tree peg, and the soil filled in.

The planting board serves another purpose in that it ensures the planting of the tree at the proper depth—the depth at which it was grown in the nursery. The mark can usually be distinguished on the tree.

The union of the stock and scion is always a weak spot in a tree and liable to attack from fungous diseases; it should, therefore, be kept above the level of the soil. When using the planting board, the union should be kept slightly above the top of the board to ensure that the tree is not planted too deeply.

In digging the holes for the trees, the surface soil should be taken out and kept on one side. The subsoil at the bottom of the hole should be finely broken up. If the land has been properly prepared, there will be no need to dig deep holes. So long as they are large enough to space the roots without cramping, they will serve the purpose. A little top soil may be returned to form a small mound at the bottom of the hole.

The roots, which should be carefully washed and trimmed, should be spaced as evenly as possible, and with a downward and outward slope of from 40 to 45 degrees. The spaces should then be filled with fine soil and pressed firmly, water being applied and allowed to soak in before the hole is completely refilled with soil. Where there is danger of sun-scald the trees should be protected by cylinders of paper placed around the trunks.

TALL-GROWING VARIETIES OF BANANAS.

At present, the standard commercial banana is the Cavendish, a relatively low-growing form.

Although some of the tall-growing types—such as the Gros Michel, Williams' Hybrid, Vernon, and Mons Marie—have been in cultivation in small areas for a long period, the demand for suckers of these varieties has only recently become of any consequence. In certain favoured localities, they may yet become as popular as the shorter-growing Cavendish.

The fruit of some tall-growing varieties compares favourably with the Cavendish in both size and quality, while their carrying capacity is frequently superior.

Under ordinary conditions, cultural methods applicable to the Cavendish banana can be used for tall varieties. They respond to approved desuckering systems used for the Cavendish and, generally speaking, yield a greater weight of fruit per acre. The returns per acre from tall varieties are thus sometimes better than those received from the more widely-grown Cavendish.

CONTROL OF WHITE LOUSE OF CITRUS.

White louse of citrus occurs throughout the State, and although temperature does not appear to be an important factor determining its abundance, there seems to be reason for believing that it prefers dry

climatic conditions. All portions of the tree are subject to attack, but infestation generally starts on the trunk near ground level and spreads upwards. The male scales are a very conspicuous white colour, and as they are much more numerous than the female scales, a colony of this species produces a white appearance on the infested surface which has led to its being given the quite appropriate name of white louse.

It is not a difficult insect to control, but growers should remember that vigorously-growing trees are much less susceptible to attack than trees in poor health. The health of infested trees should, therefore, be attended to in order to reduce susceptibility, and whatever adverse factor is impairing their health should be eliminated so far as practicable.

Spraying with lime sulphur or resin-caustic soda-fish oil gives a very good control of white louse. Control is generally best accomplished by spraying in the late winter just before blossoming, using lime-sulphur at a strength of one to twelve. The preference for lime-sulphur is based very largely on the fact that its application is attended by other beneficial results in addition to establishing control of white louse.

When the correct time for spraying has arrived certain late-maturing varieties—e.g., the Valencia late—may still be carrying fruit. This does not really matter very much, because usually only the inside parts of the tree require spraying. However, should the harvesting of the crop have been completed, then it is desirable that the whole tree be sprayed.

Fumigation with hydrocyanic acid gas also gives a good control of the white louse, and can be employed against it when conditions render fumigation practicable.

THE REMOVAL OF SOOTY MOULD FROM CITRUS FRUITS.

Because of the very wet weather during late summer and autumn, citrus-growers in the coastal areas were not able to adhere to the normal spray programme. As a result, scale insect infestation, particularly pink wax scale, is now at a very high level, and, as usual, is accompanied by a copious growth of sooty mould. Many growers will be considerably inconvenienced by the presence of this growth on the fruit. The fungus, as most growers are aware, subsists on the sweet secretions of certain scale insects, notably pink and white wax. Except in very severe cases, it causes little direct injury to the tree, but the disfiguration of the fruit is a serious matter.

Various methods are used for the removal of sooty mould. In all of them, injury to the rind should be avoided at all costs, because it opens the way to infection with blue or green mould in the fruit. With moderate blemishes, a light brushing of the fruit will suffice. If the fruit is badly affected, brushing, sufficient to remove the mould, may seriously injure the rind. Cleaning the fruit in a rotating barrel partially filled with sawdust is a method very commonly used but has little to recommend it. Damaged rind and bruised flesh too often result from this procedure.

If washing has to be resorted to, the fruit should be immersed for about one minute in a solution containing $\frac{1}{4}$ lb. of boracic acid and $\frac{1}{4}$ lb. chloride of lime to each gallon of water. This solution has been used extensively by growers and has been found very satisfactory. After immersion in the cleansing solution, the fruit should be well washed in clean water to avoid a whitish deposit on drying, and then should be dried thoroughly before packing.

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

FRUIT marketing conditions during June were affected by climatic diversity, and prices varied correspondingly.

The rain in April and early in May affected detrimentally the keeping qualities of most fruits, citrus fruits particularly. Some growers lost through not sweating the fruit before marketing.

Bananas were hard to quit, some lines not ripening satisfactorily. Growers are advised to leave the fruit hang as long as possible, and to retard the development of the exposed side of the bunch by covering it. This allows the back of the bunch to fill to the same quality as the exposed side, forming a full bunch of quality fruit when cut.

Many inquiries have come from growers desiring to colour tomatoes. It is again advised that leaving the fruit on the plant is the quickest method. Where this is not practicable, the fruit should be allowed to mature on the plant, and be coloured in a properly-built cabinet using ethylene gas. Acetylene gas from carbide has not proved satisfactory for tomatoes, although it has given good results with citrus fruits.

Too much green fruit still goes on to southern markets; this applies particularly to pineapples and papaws. Last month's experience has shown the necessity for marketing only quality fruit, as most lines have been sold at unpayable prices after staying on the agents' sections for lengthy periods.

For marketing conditions to show any great improvement, an extended period of bright, sunny weather is necessary. Prices should then advance to high levels.

The following were the ruling market prices during the last week of the month of June, 1939:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Small, 4s. 6d. to 7s.; sixes, 4s. to 10s.; sevens, 4s. 6d. to 13s.; eights and nines, 12s. 6d. to 15s.

Sydney.—Cavendish: Sixes, 10s. to 12s.; sevens, 12s. to 14s.; eights and nines, 14s. to 16s.

Melbourne.—Cavendish: Sixes and sevens, 8s. to 9s.; eights and nines, 8s. to 10s.

Lady's Finger: 1½d. to 9d. per dozen.

Pineapples.

Brisbane.—Smoothleaf, 4s. to 7s. per case; loose, 2s. to 5s. 6d. dozen; Ripley, 4s. to 6s. case; 1s. 6d. to 3s. 6d. dozen.

Sydney.—Smoothleaf, 7s. to 11s.

Melbourne.—Smoothleaf, 8s. to 11s.

Papaws.

Brisbane.—Yarwun, 3s. to 5s. bushel; Gunalda, 3s. to 4s.; Local, 1s. 6d. to 3s. 6d.

Sydney.—6s. to 12s.

Melbourne.—7s. to 10s.

Green fruit unsaleable.

Custard Apples.

Brisbane.—2s. to 3s. 6d. half-bushel.

Sydney.—5s. to 7s. half-bushel.

Melbourne.—6s. to 8s. half-bushel. Cool weather causing market to ease.

Monstera Deliciosa.

Brisbane.—3s. to 6s. dozen.

Avocados.

Brisbane.—6s. to 8s. per half-bushel; special higher.

Sydney.—8s. to 9s.

Granadillas.

4s. to 6s. dozen.

Passion Fruit.

Brisbane.—Firsts, 6s. to 10s.; seconds, 4s. to 5s.

Sydney.—3s. to 8s. half-bushel

Melbourne.—8s. to 10s. half-bushel

Other Tropical Fruits.

Coconuts, 3s. to 5s. dozen.

CITRUS FRUITS.

Oranges.

Brisbane.—Navels: Gayndah, 6s. to 10s.; Locals, 6s. to 8s. Commons: 4s. to 7s. bushel.

Mandarins.

Brisbane.—Emperor, 3s. to 6s. bushel; Glens, 6s. to 10s.; small, 4s. to 5s.; Scarlets, 3s. to 7s.

Grapefruit.

Brisbane.—4s. to 7s. bushel case.

Queensland consumers are not yet grapefruit-minded, due, possibly, to the many poor varieties marketed in the past.

Lemons.

Brisbane.—Locals, 3s. to 8s.; Gayndah, 6s. to 10s.; Benyenda, 10s. to 12s.

DECIDUOUS FRUITS.

Apples.

Brisbane.—Jonathan, 8s. to 11s. per bushel; Granny Smith, Stanthorpe, 8s. to 12s.; Sturmer, 7s. to 8s.; Cleopatra, 7s. to 11s.; French Crab, 5s. to 7s.; Scarlets, 6s. to 8s. 6d.

Pears.

Brisbane.—Josephine, 8s. to 13s.; Packham's Triumph, 6s. to 11s.; Winter Cole, 9s. to 14s.

OTHER FRUITS.

Tomatoes.

Brisbane.—Ripe, 1s. 6d. to 3s. 6d.; coloured, 2s. to 5s.; green, 1s. to 3s., and very hard to sell.

Melbourne.—8s. to 10s.

Sydney.—Cleveland, 2s. to 4s.; Bowen, 3s. to 5s.

Cape Gooseberries.

5d. to 7d. per lb.

Strawberries.

Brisbane.—6s. to 12s. dozen boxes.

Sydney.—Trays, 3s. to 5s. each; boxes, 9s. to 14s. per dozen.

MISCELLANEOUS, VEGETABLES, &c.

Cucumbers.—*Bowen:* 7s. to 10s. bushel.

Pumpkins.—*Brisbane:* 4s. to 5s. 6d. bag. *Sydney:* 6s. to 8s. bag.

Marrows.—1s. to 2s. 6d. dozen.

Lettuce.—6d. to 1s. 6d. dozen.

Cabbages.—Small, 2s. to 3s. dozen; prime, 5s. to 7s.

Cauliflowers.—Small, 2s. to 4s. dozen; large, 9s. to 12s.

Beans.—*Brisbane:* 7s. to 9s. per sugar bag, inferior lower. *Sydney:* 8s. bushel. *Melbourne:* 3d. to 5d. lb.

Peas.—8s. to 10s. *Melbourne:* 3d. to 5d. lb.

Beetroot.—6d. to 1s. bundle.

Chokos.—6d. to 1s. dozen.

Carrots.—3d. to 1s. bundle.

Celery.—Local, 1s. 6d. to 2s. bundle; South Australian, 15s. to 17s. crate.

Rhubarb.—9d. to 1s. 6d. bundle.

The Veterinary Medicines Acts, 1933 to 1938.

F. B. COLEMAN, Registrar of Veterinary Medicines.

Veterinary medicines under the above Acts include the following:—

Alteratives
Antiseptics
Aperients
Applications
Barbed wire preparations
Biological products
Black oils
Blackleg preparations
Blight preparations
Blister preparations
Blood mixtures
Bot preparations
Canker preparations
Cat medicines
Condition powders
Constitution powders, balls, &c.
Correctives
Disinfectants (animal)
Distemper preparations
Diuretic preparations
Dog medicines
Drenches
Eczema preparations
Embrocations
Eye preparations
Foot preparations
Gall preparations
Garget preparations
Germicides (animal)
Greasy heel preparations
Iodine preparations
Kidney preparations
Lampas preparations
Laxatives
Leg preparations
Liniments
Lotions
Lung worm preparations
Mammitis preparations
Mange preparations
Ointments
Pessaries
Physic balls
Poultry medicines
Purgatives
Redwater preparations
Roup preparations
Scour preparations
Sexual stimulants
Skin preparations
Specifics
Stomach preparations
Tonics
Udder preparations
Vaccines
Vaginitis preparations
Wart preparations
White oils
Worm preparations

and any mixture, compound, or preparation of one or more drugs or ingredients in any form or any biological products, including both living and dead vaccines, sera, and diagnostic agents intended to be administered to stock by any means.

Every seller of veterinary medicines has to obtain a license—costing 5s. yearly—in the month of January.

All veterinary medicines offered for sale in Queensland must be registered every three years, i.e., 1939, 1942, 1945, &c., during the month of January with yearly payment of fees. Application for registration involves the forwarding of a statutory declaration, setting out the formula of the preparation, accompanied by a specimen label and sample, and the necessary fees, i.e., £1 1s. for the first preparation, and 5s. for each subsequent veterinary medicine, with a maximum of £5 5s. pèr year. These applications are duly examined with respect to the Act's requirements and placed before the Veterinary Medicines Board—consisting of the Agricultural Chemist, Chief Inspector of Stock, a bacteriologist, and a veterinary surgeon.

The formulae, claims, and statements made are considered, and, if approved, the veterinary medicine, upon completion of all the Act's requirements, is duly registered.

All labels are required to set out the following:—

(*a*) The distinctive name of the veterinary medicine;

(*b*) The net weight contained in the package, or, in the case of liquids, the true volume content expressed in Imperial measure;

(*c*) In the case of any liquid veterinary medicine having or claiming to have germicidal and/or disinfecting properties, its bactericidal efficiency expressed in terms of absolute phenol (100 per cent.) as determined by the Rideal-Walker test;

(*d*) A printed statement giving quantity or proportion of any substance or substances prescribed in the Second Schedule of the Regulations.

(*e*) In the case of biological products, in addition to the other requirements of the Regulations, the date from which they should no longer be used; this must be expressed in the following manner:—

"Kept in a dark, cool place, this product remains fully potent until [*Here insert date*].

(*f*) The name and address of the Queensland primary dealer or manufacturer;

(*g*) All directions for use of the veterinary medicine;

(*h*) The following wording:—

"Registered under the Queensland Veterinary Medicines Acts";

(*i*) The word POISON when required.

All veterinary medicines containing *Carbon tetrachloride, Tetrachlorethylene, and Trichlorethylene,* must be labelled "Poison" and packed in the manner prescribed by Regulation 15 under the Veterinary Medicines Acts.

The word "POISON" should be in red letters on a white ground, in larger and heavier type than any other letter on the label; and no other word shall appear on the same line. No other letter on the label shall be in a red colour.

Farmers and other buyers would be well advised **never to accept delivery** of any veterinary medicine unless it has affixed to the package a plainly printed label setting out the required information.

In the absence of a label it is obvious that the buyer should at once communicate with the Department of Agriculture, William street, Brisbane.

The Veterinary Medicines Acts provide that no person shall affix any label to or use or issue with or in connection with any veterinary medicine offered for sale, directions for use, or any printed, typed, or written matter, and/or advertisement which contains any statement or

claim which directly or by implication indicates or suggests that it will prevent or cure the following diseases:—

Malignant growths (cancer), tuberculosis, or contagious abortion.

The veterinary medicines as set out in the following list are those that have been registered for the three-year period January, 1939, to December, 1941, under the above Acts. These and any published in subsequent lists are the only veterinary medicines that should be offered for sale or requested by prospective purchasers.

It should be noted that the sale of any unregistered veterinary medicine would render the seller liable to a penalty not exceeding £20.

Veterinary Medicines Registered for the period January, 1939, to December, 1941.

List published on 31*st May,* 1939, *in accordance with section* 6 (7) *of the Acts.*

	Reg. No.
A.C.F. and Shirleys Fertilizers Limited, Brisbane—	
A.C.F. Cop-Nic	1732
Andrew Dryden's Famous Blood and Water Powders for Horses and Cattle	446
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Bio Scours Remedy	380
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Bio Soothing Liniment	381
Bio Spasmodic Colic Drench	382
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Nycatone	2007
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Sayers Blu-Nik	1604
Sayers Green Seal Fluke Drench—Single Strength	162
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Happidog Canker Lotion	1707
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Happidog Puppy Worm Syrup	340
Happidog Trumpit Distemper Mixture	341
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Diamontone Poultry Tonic	1736
Denny, A. G., 42 Nebo Road, Mackay—	
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Denny's Bot Worm Expeller (Horses)	2279
Denny's Burn Application	2280
Denny's Colic Drench (Wind Colic) for Horses and Cattle	2290
Denny's Cow Impaction Drench	2281
Denny's Gall and Chafe Cure	2292
Denny's Gland Liniment	2282
Denny's Hoof Dressing	2285
Denny's Kidney Drench (for Horses)	2288
Denny's Mange Ointment (Itch Ointment for Horses)	2283
Denny's Purgative Drench (Purge for Horses)	2291
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Denny's Sprain Liniment	2289
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Osmonds Cattle Shampoo	1132
Osmonds Chlorosyl	2167
Osmonds Compound Santonin Worm Powders for Pigs	1477
Osmonds Concentrated Ovolis	480
Osmonds Ethodyne	1072
Osmonds Fluid Zenos Disinfectant	337
Osmonds Foot-Rot Paste	1074
Osmonds Grease Wash	2168
Osmonds Hooseiline	479
Osmonds Oxygas	209
Osmonds Pig Powders	347
Osmonds Saltona Blood Salt	330
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Happidog Eye Ointment	2298
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Day, Son & Hewitts Curdolix	297
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Day, Son & Hewitts Red Paste or Condition Balls	308
Day, Son & Hewitts Red Worm Mixture	309
Day, Son & Hewitts Udder and Sore Teat Salve	310
Day, Son & Hewitts Universal Brown Chemical Extract	296
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Baxters Kidney and Bladder Pills	405
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Baxters No. 2 Worm Capsules	458
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Baxters Puppy Worm Syrup	406
Baxters Red Tonic	407
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Baxters Skin Lotion	403
Baxters Stomach and Bile Pills	396
Baxters Tasteless Condition Powders	397
Baxters Worm Powders for All Dogs	409
Judge's Blight Lotion	2102
Judge's Blight Powder	2090
Judge's Bot Bombs	2084
Judge's Bot Powders	2085
Judge's Colic and Gripe Drench	2087
Judge's Condition Powder	2098
Judge's Cough and Cold Remedy	2095
Judge's Dairy Drench	2099
Judge's Dairy Ointment	2101
Judge's Foot-Rot Powder	2093
Judge's Mange Oil	2096
Judge's Nasal Ointment	2089
Judge's Physic Balls	2083
Judge's Poultry Powder	2086
Judge's Purple Paint	2091

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Judge's Scour Powder	2103
Judge's Special Tasteless Horse Laxative	2088
Judge's Vaginal Pessaries	2104
Judge's Vaginitis Powder	2092
Judge's Veterinary Embrocation	2106
Judge's Vettoll	2105
Judge's Wart Ointment	2100
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Cutter Blackleg Antigen (Blacklegol)	78
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Mactaggart's Carbol	1065
Mactaggart's Carbon Tetrachloride Fluke and Worm Drench	228
Mactaggart's Medicated Speying Tar	1271
"Max-tar" Dehorning Dressing	2449
Mitchell, Kenneth, Brisbane—	
Barko Alterative Blood Mixture	1624
Barko Anti-Diarrhoea Mixture	1627
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Barko Canker Powder	1618
Barko Distemper and Cough Mixture	1626
Barko Ear Canker Lotion	1631
Barko Eczema Pills	1614
Barko Eye Lotion	1628
Barko Eye Ointment	1617
Barko Iodine Dog Soap	1622
Barko Liniment	1625
Barko Lotion for Cuts, Wounds, and Abrasions	1633
Barko Mixture for Chorea (St. Vitus' Dance)	1623
Barko Pad Paint	1632
Barko Pills for Gastritis	1616
Barko Pills for Rheumatism	1615
Barko Powders for Chorea (St. Vitus' Dance)	1620
Barko Skin Lotion	1612
Barko Tasteless Condition Powders	124
Barko Tonic Food	1634
Barko Worm Mixture for Dogs	1629
Barko Worm Mixture for Puppies	1630
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Moase, W. E., Wynnum—	
Alterative and Condition Powder for Horses and Cattle	350
Moase's Famous Antiseptic Disinfectant Deodorant	351
Moase's Famous Blister "The Ideal"	352
Moase's Famous Dairy Ointment	353
Moase's Famous Diarrhœa or Scour Mixture	354
Moase's Famous Draught for Horse or Cow for Colic	355
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Moase's Famous Eye Specific	357
Moase's Famous Liniment	358
Moarse' Famous Specific for Tympanites, Bloat, or Hoven	1454
Moase's Famous Specific for Worms in Calves, Sheep, &c.	360
Moase's Famous Purgative and Worm Balls for Horses	1742
Moase's Special Liniment	361
Murray, K., East Brisbane—	
Fleet-Foot Pad Paint	2385
New Zealand Loan and Mercantile Agency Company Limited, Brisbane—	
Cooper's Antiseptic Powder	2200
Cooper's Condition Powders	2240
Cooper's (Improved) Worm Tablets	85
Kur-Mange	87
Lavene Animal Wash	86
Zealone AHP Nicotine and Bluestone Sheep Drench	1666
Zealone AHP Sheep Drench for Worms and Fluke	1120

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Nicol Chemical Company Proprietary Limited, Brisbane—	
Nicol's White Oil Embrocation	1075
Nobles Proprietary Limited, Brisbane—	
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Sykes's Animol	38
Sykes's Concentrated Animal Chemical Food	39
Sykes's Creatol	40
Sykes's Drench	41
Sykes's Farm and Home Embrocation	42
Sykes's Udderine	43
Noble, W. A., and Sinnamon, Toowoomba—	
Bot Capsule	1956
Noble's Aperient Pills for Large Dogs	213
Noble's Aperient Pills for Small Dogs	212
Noble's Blight Lotion	80
Noble's Cleansing and Tonic Dairy Drench	79
Noble's Colic and Gripe Drench	1391
Noble's Dairy Ointment	1390
Noble's Dog Alterative	160
Noble's Dog Condition Powder	1601
Noble's Mange Oil	161
Noble's Non-Irritant Fluid Blister	1392
Noble's Physic Balls	434
Noble's Poultry Powder	81
Noble's Scour Remedy for Calves	82
Noble's Tonic Alterative and Condition Powders	426
Noble's Vettoll	83
Noble's Wart Ointment for Poultry	1586
Noble's Worm and Condition Pills (Large Dogs)	215
Noble's Worm and Condition Pills (Small Dogs)	214
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Sidolia	265
Sidolia Dairy Ointment	2348
Sidolia Powder for Controlling Mammitis	1730
Nyal Company, Brisbane—	
Krect Condition Powders	1674
Krect Condition Tablets	1675
Krect Laxative and Stomach Tablets	1677
Krect Mange Lotion	1676
Krect Puppy Worm Syrup	1678
Krect Veterinary Ointment	1873
Krect Worm Capsules (Nos. 1, 2, 3)	1673
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Burnett Worm Drench Powder	164
Parke Davis and Company, Brisbane—	
Bio 731 Antibronchisepticus Serum (Canine)	2366
Bio 813 Equine Influenza Mixed Bacterin	2365
Bio 805 Mixed Bacterin (Canine)	2364
Bio 808 Mixed Bacterin (Canine)	2363
Bio 827 Streptococcus-Staphylococcus Bacterin (Equine)	2367
Blackleg Vaccine (Blacklegoids) Single	70
Blackleg Vaccine (Blacklegoids) Double	71
Nema Worm Capsules	69
Nema Worm Drench	180
Parke Davis & Co.'s Fluke and Worm Drench (Double Strength)	179
Tetanus Antitoxin (Veterinary)	72
Worm and Fluke Drench Special	178
Pennefather, E. K., Brisbane—	
Golden Egg Fowl Pox Vaccine (Attenuated)	1889

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Red Comb Bronchitis Cure	49
Red Comb Chick Tonic	50
Red Comb Cleansing and Tonic Drench	51
Red Comb Eye Roup Cure	52
Red Comb Fowl Pox Vaccine (Attenuated)	76
Red Comb Iodine Specific	470
Red Comb Nicotine Sulphate "40"	1691A
Red Comb Roup Cure	53
Red Comb Scaly Leg Ointment	54
Red Comb Tonic Spice	2333
Red Comb Vaginitis Powder	1368
Red Comb Veterinary Iodine	55
Red Comb Vi-Tone (Poultry Tonic)	437
Red Comb Wart Preventative	56
Red Comb Worm and Condition Powders	57
Red Comb Worm Capsules	75
Red Comb Worm Killer	436
Queensland Pastoral Supplies Proprietary Limited, Brisbane—	
"Hibiscus" Nicotine Sulphate	2427A
Stockaid Bluestone Snow	1865
Stockaid Concentrated Arsenical Sheep Drench	1866
Stockaid "Double V" (Veterinary Standard) Drench	1976
Stockaid "Double X" Drench	1870
Stockaid "Fifty-Fifty" Drench	1868
Stockaid "Single X" Drench	1869
Reichel, H. G., Brisbane—	
Berg Oil	2166
Riddell, R. A. (Bayer-Pharma Limited), Brisbane—	
Aricyl	66
Ascaridol	1662
Astibulin Polyvalent Joint-Ill Serum	1647
Carbo-Pulbit	1653
Entozon (Granulate)	1664
Istin	67
Joint Ill Vaccine (Astibulin Vaccine)	1992
Murnil	1253
Nemural	1528
Odylen	68
Omnadin	1659
Pellidol Ointment	1655
Veridan	1252
Robinson and Bott Proprietary Limited, Brisbane—	
Rawleighs Colic and Bloat Ease	23
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Rawleighs Roup Powder	129
Rawleighs Stock Tonic	233
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Bob Martin's '92 Ointment	421
Bob Martin's Tasteless Condition Powders	399
Bob Martin's Worm Powders	420
Bob Martin's Worm Tablets	419
Elliman's Royal Embrocation	47
Sharkey, S. B., Mackay—	
Bot and Worm Expeller	424
Sharkey's Special Physic	425
Smith, H. F., Brisbane—	
Co-Lak Vaginitis Remedy	1119
Soden, J., Brisbane—	
Pep Health Powder for Dogs	2230

Surgical Supplies Limited, Brisbane—

	Reg. No.
A.B.C. Blood Tonic	2112
A.B.C. Canker Lotion	1304
A.B.C. Canker Powder	1526
A.B.C. Coca Skin Oil	1525
A.B.C. Cough Mixture	1523
A.B.C. Eczema Powder	1524
A.B.C. Eye Drops	1395
A.B.C. Green Ointment	1521
A.B.C. Luberine Oil	1566
A.B.C. Tasteless Condition Powders	1234
A.B.C. Puppy Worm Syrup	1394
A.B.C. Worm Mixture	1305
A.B.C. Zip Ointment	1522
A.B.C. 3 in 1 Worm Capsules	2242
Aloetic Physic Ball (Wyleys Ltd.)	1792
Alterative Worm and Condition Powders	137
Bio Blackleg Aggressin	258
Bio Blackleg Pellets	260
Bio Blackleg Toxiculture	259
Bio Mastitis Toxiculture	274
Bio Pleuro-Virus	261
Bio Strangles Toxiculture	275
Blackleg Cords	262
Blackleg Solid Aggressin	332
Dr. Metcalfe Sharpe's Application	138
Duttons Mange Specific	139
Duttons Redwater Cure	140
Equine Cough Syrup	141
Gelatine Coated Cough Balls No. 17 (Wyleys Ltd.)	1982
Gelatine Coated Diuretic Balls No. 8 (Wyleys Ltd.)	1979
Gelatine Coated Tonic Balls No. 10 (Wyleys Ltd.)	1981
Gelatine Coated Worm Balls No. 13 (Wyleys Ltd.)	1980
Gripe Drench	216
Sapocarb	362
Scour Powders	142
Sexine	1238
Spavin Paste	217
Special Bull Tonic	143
S.S. Black Oil	145
S.S. Blight Powder	146
S.S. Heal-All Ointment	147
S.S. Lung Worm Specific	148
S.S. Reliable Embrocation	149
S.S. Scour Cure	150
S.S. Tonic Powder for Cattle	151
S.S. Udder Specific	152
Surgical Supplies Antiseptic Vaginal Kugloids	144
Surgical Supplies Blister	153
Surgical Supplies Dairy Ointment	154
Surgical Supplies Gall Cure	218
Surgical Supplies Garget Powder	1050
Surgical Supplies Ltd. Cleansing Drench	155
Surgical Supplies Ltd. Lampas Cure	156
Surgical Supplies Ltd. Worm Powders for Horses	157
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Taylors Elliotts and Australian Drug Proprietary Limited, Brisbane—

Austral Aloetic Physic Ball	94
Austral Arsenic and Copper Worm Drench for Sheep	73
Austral Barb Wire Embrocation	95
Austral Blood and Water Drench	96
Austral Bot Mass Capsules	1949
Austral Calcifer Powder	97
Austral Calcifer Solution	98
Austral Canker Ointment for Dogs	1859
Austral Caustic Stick	99
Austral Cleansing Drench	100

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Taylors Elliotts and Australian Drug Proprietary Limited, Brisbane—*contd.*	
Austral Cold and Fever Mixture for Dogs	1847
Austral Cooling Lotion	101
Austral Dairy Ointment	102
Austral Dusting Powder	103
Austral Gall Ointment	105
Austral Garget Powder	106
Austral Green Liniment for Dogs	1848
Austral Gripe Drench	107
Austral Horse Blister	108
Austral Iodine Capsules	109
Austral Liquid Blister	110
Austral Lung Worm Drench	74
Austral Mange Dressing	111
Austral Mange Lotion for Dogs	1849
Austral Pig Cough Powder	112
Austral Pig Purgative Powder	113
Austral Pig Worm Powders	114
Austral Puppy Worm Syrup	1850
Austral Regulating Drench	115
Austral Ringworm Ointment	116
Austral Scour Drench	117
Austral Tonic Powders for Dogs	1851
Austral Trypan Blue	118
Austral Vaginal Douche Powders	119
Austral Vaginal Pessaries	120
Austral Veterinary Embrocation	121
Austral Wart Paint	122
Austral Worm Capsules for Dogs	1929
Austral Worm and Condition Powders	123
Bickmore's Gall Cure	125
Blackleg Aggressin (Cultural) (Solid)	1975
Blackleg Antigen (Blacklegol) (Cutter)	1974
Butler's Leeming's Essence	398
Cupiss' Aromatic Physic Balls	326A
Cupiss' Condition Powders for Dogs	1123A
Cupiss' Constitution Balls	327A
Cupiss' Embrocation	328A
Cupiss' Tonic Powders	320A
Dog Constitution Capsules (Cupiss')	1124A
Lieut. James' Blistering Ointment	279
Skinner's Cleansing and Tonic Drench	127
Skinner's Ointment	126
Stevens Ointment	433
Weaver's Sheep Drench	411
Tudor and Petty, Toowoomba—	
Condition Powder for Horses	165
Stock Cough Paste	181
Vaginitis Powder	166
United Chemical Company Limited, South Brisbane—	
Cresola No. 1	2040
Germacol	1053
United Concentrated Arsenic and Epsom Salts Liquid Drench	318
United Fluke and Worm Drench	229
United Medicated Stockholm Tar	1270
United Nicotine Sulphate-Bluestone Worm Drench	2381
E. P. Walsh, Gympie—	
Cattle Blight Specific	1457
Scour Specific for Calves	1458
Warwick Friendly Societies Association, Warwick—	
Equine Physic Powder	1425
Turner's Sheep Drench	1274

	Reg. No.
Webster Bros. Proprietary Limited, Brisbane—	
Hamilton Preparations.	
Blakemere Eczema Cure	253
Hamilton Fistula Vaccine	257
Hamilton Mammitis Vaccine	183
Hamilton Strangles Vaccine	256
Pro-Vet Antiseptic Capsules	184
Pro-Vet Black Spot Application	186
Pro-Vet. "Blighty"	187
Pro-Vet Bloat Draught	188
Pro-Vet Cantharides Compound Blister	208
Pro-Vet Colic Remedy for Horses	192
Pro-Vet Condition Powder	416
Pro-Vet Cough Electuary for Horses	193
Pro-Vet Diuretic or Staling Powder	194
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Pro-Vet Foot-Rot Paste	196
Pro-Vet Gall Cure	222
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Pro-Vet Liquid Blister	267
Pro-Vet Pig Powders	254
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Pro-Vet Scour Remedy	202
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Carbene Sheep Drench	1063
Cee-Tee-Cee Sheep Drench	1064
To-Cu-Sul Sheep Drench	1719
Too-Partz Sheep Drench	2132
Wurm-Ez-Ol Sheep Drench	1062
Wilcox Mofflin Limited, Brisbane—	
Cesto Tape Worm Drench for Sheep and Lambs	336
N-ee-ma	1459
Nikosul	1598A
Red Spot Double Strength	225
Tetralene	226
Tri-Kos Concentrated Sheep Drench	1130
Tri-Kos Nicotine-Bluestone Sheep Drench	1130A
Tri-Kos Separate Ingredients (Nicotine Sulphate) (Copper Sulphate)	1440
Wilkinson, L. A. (Northern) Proprietary Limited, Brisbane—	
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Wilkinsons Cleansing Drench	284
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Index of Brands that are not indicated in the foregoing list by the Primary Dealer's Name.

Brand.	Primary Dealer.
A.B.C.	Surgical Supplies Ltd.
Acco	Australian Chemical Co. Pty. Ltd.
Andrew Dryden's	A.C.F & Shirleys Fertilizers Ltd.
Austral	Taylors Elliotts & Australian Drug Pty. Ltd.
Bailey's	Winchcombe Carson Ltd.
Barko	Mitchell, Kenneth
Bayer	Riddell, R. A.
Baxters	Maclean, D. Pty. Ltd.
Benbow's	Butler, Edward & Co. Ltd.
Bickmore's	Taylors Elliotts & Australian Drug Pty. Ltd.
Bio	Bryce Ltd.
Bio	Buzacotts (Q'ld.) Ltd.
Bio	Parke Davis & Co.
Bio	Surgical Supplies Ltd.
Blakemere	Webster Bros. Pty. Ltd.
Bob Martin's	Salmond & Spraggon (Aust.) Pty. Ltd.
Burnett	Outridge Chemical Co.
Butler's	Taylors Elliotts & Australian Drug Pty. Ltd.
C.N.	Norris Agencies Pty. Ltd.
Cooper's	New Zealand Loan & Mercantile Agency Co. Ltd.
Cupiss'	Cramsie Dwyer & Co.
Cupiss'	Taylors Elliotts & Australian Drug Pty. Ltd.
Cutter	Mactaggarts Primary Producers Co-op. Assn. Ltd.
Cutter	Taylors Elliotts & Australian Drug Pty. Ltd.
Day, Son & Hewitts	Lovelock, W. & Co. Pty. Ltd.
Dr. Metcalfe Sharpe's	Surgical Supplies Ltd.
Duttons	Surgical Supplies Ltd.
Elliman's	Salmond & Spraggon (Aust.) Pty. Ltd.
Evpro	Evans Products Agency
Gilmours	Finn, J. F.
Hagley's	Butler, Edward & Co. Ltd.
Hamilton	Webster Bros. Pty. Ltd.
Happidog	David, F. D.
Happidog	Happidog Stores Pty. Ltd.
Hayden's	Ling, H. J.
Judge's	Maclean, D. Pty. Ltd.
Krect	Nyal Co.
Lieut. James'	Taylors Elliotts & Australian Drug Pty. Ltd.
Mawson's	Armitstead, J.
Meggitts	Gollin & Co. Pty. Ltd.
Nema	Parke Davis & Co.
Osmonds	Flynn Bros.
Pegasus	Bryce Ltd.
Pro-Vet	Webster Bros. Pty. Ltd.
Radiol	Bickford, A. M. & Sons Ltd.
Red Comb	Poultry Farmers Co-op. Society Ltd.
Rawleighs	Robinson & Bott Pty. Ltd.
Sayers	Dalgety & Co.

Brand.	Primary Dealer.
Sidolia	Norris Agencies Pty. Ltd.
Skinner's	Taylors Elliotts & Australian Drug Pty. Ltd.
S.S.	Surgical Supplies Ltd.
Stevens	Taylors Elliotts & Australian Drug Pty. Ltd.
Stewarts	Buzacotts (Qld.) Ltd.
Stockaid	Queensland Pastoral Supplies Pty. Ltd.
Sykes's	Nobles Pty. Ltd.
Tri-kos	Wilcox Mofflin Ltd.
Turner's	Warwick Friendly Societies' Association
Vallo	Leggo, A. Victor & Co. Pty. Ltd
Vetamac	McDonald, A. H. & Co. Pty. Ltd.
Vita Lick	Webster Bros. Pty. Ltd.
Wagstaff's	Australian Disinfectant Co.
Weaver's	Taylors Elliotts & Australian Drug Pty. Ltd.
Wyleys Ltd.	Surgical Supplies Ltd.
Zealone A.H.P.	New Zealand Loan & Mercantile Agency Co. Ltd.

Plate 43.

Where the Jungle Comes Down to the Sea.—A sheltered beach on the coast near Cairns.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Jersey Cattle Society, Australian Illawarra Shorthorn Society, and the Friesian Cattle Society, production charts for which were compiled during the month of May, 1939 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	JERSEY.			
	MATURE COW (STANDARD 350 LB.)			
Trinity Daffodil 2nd	J. Sinnamon and Sons, Moggill	9,543·12	486·129	Some Hope
Trinity Golden Wedding	J. Sinnamon and Sons, Moggill	8,685·29	456·334	Some Hope
Hampstead Beryl 5th	J. H. C. Roberts, 230 Herries street, Toowoomba	8,239·4	391·569	Kelvinside Favourite's Raleigh
Trecarne Chimes 2nd	T. A. Petherick, Lockyer	7,278·1	388·101	Trecarne Golden King
Maiwand Verbena	Queensland Agricultural High School and College, Lawes	7,190·56	371·439	Aveley Rex
Hampstead Olivette 2nd	J. H. C. Roberts, 230 Herries street, Toowoomba	7,071·75	370·814	Kelvinside Favourite's Raleigh
	SENIOR, 4 YEARS (STANDARD 330 LB.).			
Glenview Hawthorne	F. P. Fowler and Sons, Coalstoun Lakes	9,960·89	531·299	Trinity Governor's Hope
Pineview Royal Star	J. Hunter and Sons, Pineview, Borallon	7,968·55	434·072	Oxford Jeweller
Trinity Royal May	J. Sinnamon and Sons, Moggill	7,079·89	387·453	Some Hope
Trinity Royal Daisy	J. Sinnamon and Sons, Moggill	7,400·57	372·665	Some Hope
Oxford Kitty	Farm Home for Boys, Westbrook	6,068·3	360·3	Overlook Nancy's Remus
	JUNIOR, 4 YEARS (STANDARD 310 LB.).			
Darling of Peeramon	A. H. O. Kopper, Peeramon	6,847·3	380·65	Trinity Segunda's Prince
Trinity Spotted Beauty	J. Sinnamon and Sons, Moggill	6,701·51	352·455	Some Hope
Trecarne Lottie 6th	T. A. Petherick, Lockyer	5,890·63	343·974	Trecarne Barley King
Oceanview Molly's Buttercup	J. Sigley, Millaa Millaa	6,871·45	333·091	Rockyglen Buttercup's King
	SENIOR, 3 YEARS (STANDARD 290 LB.).			
Glenview Pontorsen	F. P. Fowler and Son, Glenview, Coalstoun Lakes	9,374·4	510·982	Trinity Governor's Hope
Oxford Thelma	J. Sigley, Millaa Millaa	8,150·65	474·237	Overlook Nancy's Remus
Trinity Graceful Duchess	J. Sinnamon and Sons, Moggill	8,805·92	458·64	Some Hope
Trinity Valley Daisy	J. Sinnamon and Sons, Moggill	7,448·82	388·569	Some Hope
Westbrook Tulip 63rd	Farm Home for Boys, Westbrook	6,892·1	318·706	Trinity Ginger Boy

JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Westbrook Tulip 68th	Farm Home for Boys, Westbrook	7,224·25	394·233	Oxford Gem's Ambassador
Oxford Flora 2nd	E. Burton and Sons, Wanora	6,997·95	378·182	Oxford Peer
Calton Averier	W. J. Semgreen, Coolabunia	7,062·0	367·895	Laddie of Calton
Trecarne Jersey Queen 2nd	T. A. Petherick, Lockyer	6,556·25	347·934	Trinity Some Officer
Bellgarth Claire De Lune	D. R. Hutton, Cunningham	6,508·75	346·13	Trecarne Renown 2nd
Bellgarth Roseleaf 2nd	D. R. Hutton, Cunningham	5,177·15	292·74	Trecarne Renown 2nd
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Glenview Lady Lynn 4th	F. P. Fowler and Son, Coalstoun Lakes	7,713·78	403·765	Trinity Governor's Hope
Glenview Meadowsweet	F. P. Fowler and Son, Coalstoun Lakes	7,494·15	388·363	Trinity Governor's Hope
Trecarne Dairymaid	T. A. Petherick, Lockyer	6,550·76	321·756	Trinity Some Officer
Broadview Hazel	W. S. Kirby, Byrnestown	5,518·85	311·05	Glenview Mason
Stoneleigh Buttercup	W. and C. E. Tudor, Branch Creek, Gayndah	6,515·44	288·631	Brooklands Royal Sirdar
Abbeystead Cocoatina	J. C. Davey, Gatton	5,203·11	256·932	Westbrook Prince 22nd
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Glenview Wallflower	F. P. Fowler and Son, Coalstoun Lakes	5,682·35	343·367	Trinity Governor's Hope
Oxford Ginger Maid	E. Burton and Sons, Wanora	6,387·8	342·787	Oxford Golden Lad
Bellgarth Queen	D. R. Hutton, Cunningham	5,790·37	326·462	Carnation Buttercup's Prince 2nd
College Floss 3rd	Queensland Agricultural High School and College, Lawes	5,696·17	307·909	Earpark General Beau
Glenview Sultane's Empress	F. P. Fowler and Son, Coalstoun Lakes	5,707·59	306·719	Trinity Governor's Hope
Bellgarth Ruby 3rd	D. R. Hutton, Cunningham	5,427·92	296·893	Trecarne Renown 2nd
Trecarne Eileen 7th	T. A. Petherick, Lockyer	4,533·98	294·295	Trinity Some Hope
Trinity Crescent	J. Sinnamon and Sons, Moggill	5,270·25	279·75	Trinity Royal Sovereign
Boree Princess	W. and C. E. Tudor, Gayndah	5,800·82	273·054	Brooklands Royal Sirdar
Carnation Dainty	W. Spresser and Son, Redbank	4,654·85	272·85	Vinchelez Golden Victory
Oxford Aster 3rd	W. J. Semgreen, Coolabunia	5,011·95	269·383	Oxford Deer
Kathleigh Flossy	C. W. Barlow, Euston road, Spring Creek	4,923·2	262·291	Retford King's Thorn
Pineview Lora	J. Hunter and Sons, Borallon	5,199·3	253·302	Oxford Fawn's Lad

Production Recording—*continued.*

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	JERSEY—*continued.*			
	JUNIOR, 2 YEARS (STANDARD 230 LB.)—*continued.*			
Bellgarth Pretty Lady 2nd	P. Kerlin, Killarney	5,558·13	253·004	Bellgarth Bellboy 2nd
Trecarne Jersey Queen 3rd	T. A. Petherick, Lockyer	5,044·38	245·232	Trinity Some Officer
Boree Charm	W. and C. E. Tudor, Gayndah	5,226·57	244·088	Brooklands Royal Sirdar
Bellgarth Galatea	D. R. Hutton, Cunningham	5,123·43	243·192	Bellgarth Bellboy 2nd
	AUSTRALIAN ILLAWARRA SHORTHORN.			
	MATURE COW (STANDARD 350 LB.).			
Cedargrove Lady Prim 11th	P. D. Fiechtner, Pilton View, Greenmount	11,254·0	452·32	Duke of Cedargrove
Kyabram Rosette (248 days)	A. H. E. Black, Kumbia	11,102·54	445·55	Ledger of Greyleigh
Corunna Opal 2nd	J. H. Anderson, Southbrook	8,604·08	350·507	Mountain Home Kitchener
	SENIOR, 4 YEARS (STANDARD 330 LB.).			
Valera Lila	M. C. and A. M. Sullivan, Pittsworth	10,519·05	443·882	Blacklands Daphne's Boy
Springleigh Beaudetta 5th (257 days)	H. F. Moller, Boonah	8,686·5	336·335	Springdale Bruce
Navillus Amy 3rd	C. O'Sullivan, Ascot, *via* Greenmount	8,991·56	351·151	Parkview Mars
	JUNIOR, 4 YEARS (STANDARD 310 LB.).			
Navillus Vera 5th (256 days)	C. O'Sullivan, Ascot, *via* Greenmount	7,988·72	319·548	Alfa Vale Re Nell
	SENIOR, 3 YEARS (STANDARD 290 LB.).			
Alfa Vale Lovely 7th (365 days)	W. H. Thompson, Nanango	15,099·65	581·031	Reward of Fairfield
Blacklands Daphne 10th	Estate of P. Doherty, Gympie	10,291·05	448·208	Sultan 2nd of Blacklands
Alfa Vale Plum 2nd	W. Hinrichsen, Clifton	9,501·8	391·052	Reward of Fairfield
Navillus Violet 4th	C. O'Sullivan, Ascot, *via* Greenmount	9,661·53	378·408	Alfa Vale Re Nell

		JUNIOR, 3 YEARS (STANDARD 270 LB.).		
Springleigh Buttercup 6th	H. F. Moller, Boonah	8,181·5	327·06	Governor of Greyleigh
Billena Buttercup	K. Henry, Tara, Watts Siding	8,871·3	316·183	Greyleigh Winall
Croydon Sunglow	T. Knopke, Laidley	9,813·88	315·249	Mount Blow Mikado
Ennismore Fancy	E. Jackson, Watts Siding	6,857·05	280·113	Navillus Amy Sheik
		SENIOR, 2 YEARS (STANDARD 250 LB.).		
Blacklands Miss Jean 16th	J. Meier, Mount Mort, Grandchester	13,533·6	532·6	Sultan 2nd of Blacklands
Rhodesview Carnation 9th	W. Gierke and Sons, Helidon	7,817·99	302·233	Blacklands Prospector
College Radiance	Queensland Agricultural High School and College, Lawes	6,913·52	299·661	Fussy's Kitchener of Hillview
Rhodesview Beauty 13th	W. Gierke and Sons, Helidon	7,843·26	286·727	Blacklands Prospector
Rhodesview Handsome 5th	W. Gierke and Sons, Helidon	7,727·92	279·748	Blacklands Prospector
Cedar Grove Queen 12th	C. O'Sullivan, Ascot, Greenmount	6,984·32	278·82	Cedar Grove Umpire
Murray's Bridge Shamrock 2nd	P. D. Fiechtner, junr., Greenmount	6,893·8	271·024	Greyleigh Winall
Tara Charm	K. Henry, Tara, Watts Siding	6,116·7	267·615	Pansy's Gift of Murray's Bridge
Billena Rose 3rd	K. Henry, Tara, Watts Siding	6,482·95	257·226	Greyleigh Winall
		JUNIOR, 2 YEARS (STANDARD 230 LB.).		
Glen Idol Queen	Estate of P. Doherty, Gympie	8,737·25	394·745	Excellency of Blacklands
Newhaven Iris 2nd	E. O. Jeynes, Raceview	8,410·45	318·279	Fairy Bower Brilliant
Sunnyside Cissy 25th	A. H. E. Black, Kumbia	7,199·86	303·452	Cosey Camp Rupert
Tara Isis	K. Henry, Tara, Watts Siding	7,474·7	299·568	Pansy's Gift of Murray's Bridge
Rhodesview Fanny 33rd	W. Gierke and Sons, Helidon	7,506·3	298·753	Blacklands Prospector
Alfa Vale Jane 6th	T. G. Lamkin, Kaimkillenbun	7,009·41	293·594	Reward of Fairfield
Valera Milkmaid	M. C. and A. M. Sullivan, Pittsworth	6,970·29	292·537	Kilburnie Royalist
Rhodesview Beauty 14th	W. Gierke and Sons, Helidon	8,517·88	289·303	Blacklands Prospector
Rhodesview Biddy 17th	W. Gierke and Sons, Helidon	7,573·6	262·243	Blacklands Prospector
Rhodesview Queenie 21st	W. Gierke and Sons, Helidon	6,803·99	254·538	Blacklands Prospector
		FRIESIAN.		
		JUNIOR, 4 YEARS (STANDARD 310 LB.).		
Tent Hill Princess	W. H. Grams, Upper Tent Hill, Gatton	11,365·54	411·894	Tent Hill Starling's Actuary

General Notes

Staff Changes and Appointments.

Mr. W. C. Armstrong, instructor in apple and pear growing, Stanthorpe, has been appointed also an inspector under the Diseases in Plants Acts.

The transfer of Mr. C. W. Steley, assistant cane tester, from the Plane Creek Mill to the Tully Mill has been cancelled, and Mr. C. W. Maslen has been appointed assistant cane tester in his place.

Sergeant (2nd Class) W. Newman (Finch Hatton), Constable J. D. Evans (Malanda), and Constable D. C. McQuaker (Eton) have been appointed also inspectors under the Slaughtering Act.

Messrs. D. Jackson (Teneriffe) and H. S. Handley (Pampas) have been appointed members of the Darling Downs North District Stallion Board and the Northern Coast District Stallion Board, respectively, in place of Mr. G. Elliot, deceased.

Mr. A. Edminstone, of Pink Lily, Rockhampton, has been appointed an honorary protector under the Fauna Protection Act.

The resignation of Mr. D. M. Corbett as assistant cane tester at the Tully Sugar Mill for the coming season has been accepted.

Mr. J. E. Maher, inspector under the Diseases in Stock Acts, the Slaughtering Act, and the Dairy Produce Acts, Department of Agriculture and Stock, will be transferred from Brisbane to Cunnamulla.

Senior-Sergeant W. G. Bonas (Gympie), Constable D. V. Farrell (Calliope), and Constable A. J. Horne (Dimbulah) have been appointed also inspectors under the Slaughtering Act.

The appointment of Mr. J. F. Shaw (Forest Home Station, Georgetown) as an honorary inspector of stock has been cancelled, and Mr. L. R. Shaw has been appointed an honorary inspector of stock at Forest Home.

The following transfers of inspectors under the Diseases in Stock Acts, the Slaughtering Act, and the Dairy Produce Acts, Department of Agriculture and Stock, have been approved:—

J. J. Shelvey, from Helidon to Allora.
W. Williamson, from Murarrie Bacon Factory to Helidon.
G. K. L. Clark, from Oxley Bacon Factory to Murarrie Bacon Factory.

Mr. J. L. Bowman (South Brisbane) has been appointed a member of the Wide Bay and Burnett District Stallion Boards.

Mr. W. R. Drew (Aspley) has been appointed an honorary protector under "*The Fauna Protection Act of* 1937."

The Officer in Charge of Police, Dirranbandi, has been appointed also an inspector under the Brands Acts.

The following officers of the Department of Agriculture and Stock have also been appointed inspectors under the Apiaries Act:—

Messrs. H. Barnes (Brisbane), C. C. Barth (Townsville), J. W. Brown (Brisbane), J. R. Canty (Cairns), J. P. H. Clark (Gladstone), H. Collard (Maryborough), T. Douglas (Goondiwindi), H. J. Freeman (Brisbane), B. Funnell (Cairns), S. A. Green (Wallangarra), J. H. Gregory (Brisbane), H. Hacker (Brisbane), D. Hardy (Rockhampton), F. T. Heers (Bundaberg), E. R. Hollamby (Maryborough), S. F. Kajewski (Bowen), K. King (Coolangatta), W. D. Lewis (Brisbane), E. J. Lorraine (Brisbane), J. W. Mackay (Rockhampton), P. McCallum (Gladstone), A. F. Moodie (Mackay), C. L. Mudd (Killarney), F. W. Olney (Coolangatta), A. Person (Brisbane), C. R. R. Roff (Brisbane), W. J. Ross (Rockhampton), J. H. Simmonds (Brisbane), J. T. Smallhorn (Coolangatta), S. C. Smith (Mackay), A. G. Smyrell (Bowen), S. E. Stephens (Cairns), R. A. Tarrant (Bundaberg), S. C. Todd (Townsville), T. E. Tuck (Townsville), H. J. Walker (Bundaberg), J. A. Weddell (Brisbane), W. C. Woodhouse (Maryborough), and A. Wooller (Townsville).

The undermentioned persons have been appointed honorary inspectors under "*The Sugar Experiment Stations Acts,* 1900 *to* 1938":—

Messrs. W. J. Stapleton(care of Mossman Mill, Mossman), E. H. Fox (care of Mourilyan Cane Pest Destruction Board, Mourilyan), C. R. Crofton (care of Haughton Sugar Co., Giru), C. S. Wynter, R. D. Sherrington, H. A. Barton, and E. A. Friend (care of Pioneer Sugar Mill, Pioneer), M. R. Preece, J. F. Epworth, A. J. Phaff, jun. (care of Proserpine Mill, Proserpine), S. J. Axam and P. J. Long (care of Racecourse Mill, Mackay), F. W. Parsons (care of Marian Mill, Marian), B. J. Bourke (care of Bundaberg Cane Diseases Control Board, Bundaberg), N. Courtice, and D. James (care of Bundaberg Cane Disease Control Board), B. A. Bourke (care of Gibson and Howes Ltd., Bingera Plantation, Bundaberg), V. Wood and N. A. W. Gibson (care of Gibson and Howes Ltd., Bingera Plantation), T. W. Pulsford and R. L. Lehfeldt (care of Fairymead Sugar Co., Bundaberg), D. N. Davidson, A. Gordon, D. B. O'Leary, and C. Colquhoun (care of Millaquin Mill, Bundaberg), A. G. Morris (Mount Bauple Sugar Mill Association Ltd., Bauple), and J. A. Clark (Mount Bauple).

Tableland Maize Board.

An Order in Council has been issued under "*The Primary Producers' Organisation and Marketing Acts,* 1926 *to* 1938," amending the constitution of the Atherton Tableland Maize Board, to provide that elections of growers' representatives on such Board shall be held triennially and that such representatives shall hold office for a period of three years.

The Apiaries Act.

A Proclamation has been issued bringing "*The Apiaries Act of* 1938" into force as from 1st July, 1939.

Regulations to give effect to the provisions of the Act have also been approved, and these provide, amongst other things, for the lodgment of applications for approval, or for the renewal of approval, of hives in which bees are to be kept and of the site thereof; for the appointment of honorary field men who shall have power to inspect and report to the Under Secretary on the registration of apiaries, the keeping of bees, and the condition of bees; and for the introduction of bees, honey, or appliances into Queensland and the conditions of such entry.

Cucumber Virus.

A Proclamation has been issued under "*The Diseases in Plants Acts,* 1929 *to* 1937," declaring cucumber virus (mosaic) to be a disease within the meaning of the abovementioned Acts.

Butter Board.

An Order in Council has been issued amending the constitution of the Queensland Butter Board to permit it to meet from its funds the expenses of taking a ballot of suppliers of cream to butter factories on the question of whether section 30 of the Primary Producers' Organisation and Marketing Acts should be extended to the dairying industry—i.e., as to whether there should be formed a dairymen's organisation along the lines of the Queensland Cane Growers' Council for the sugar farmers.

Judging of Export Pigs.

An interesting new class has been added to the Royal National Association's schedule for the August Exhibition.

It is additional to the junior judging competitions, for which special trophies have been provided.

The new class is known as the Dr. Graham Brown £10 Prize, for the best appraisal of live export baconer pigs. They have to be judged alive by the competitor for their commercial carcase value, based on export standards for the English market.

The prizes will be awarded in order of merit to the competitors whose score cards most closely approximate to the official award of the carcase judge.

Entry in this class is strictly limited to pig farmers, members of their family, and farm workers who are actively engaged in the pig-raising industry.

The pigs to be judged will be selected from the class for three baconer pigs in the commercial section, judged alive at the showground, and again at Brisbane Abattoir after they have been dressed.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of Mr. W. D. Francis, Botanist.

Native Tobacco.

Inquirer (Townsville)—

The specimen from the Mount Isa district is the native tobacco, *Nicotiana suaveolens*. Feeding tests have proved this plant to be poisonous to stock. Seddon and McGrath, who conducted feeding tests with it in New South Wales, found that 12 oz. of the dried leaves were repeatedly poisonous to sheep. On the other hand, they found that repeated small doses of less than 12 oz. were not toxic.

Mostly the plant is avoided by stock, which suggests that it is unpalatable, but hungry stock, and especially stock travelling over bare stock routes, are often forced on to it.

Purple Plum Grass. "Red Head."

D. McK. (Goondiwindi)—

No. 1. *Triraphis mollis*, Purple Plume Grass. This is rather a grass with a wide distribution in Australia. It is a handsome grass, the seed-heads soft and plume-like and usually of a purple colour, at least when mature. Silver Top is a name sometimes given to it. Stock eat it both green and dry, although it is generally regarded as of only secondary value in the mixed native pasture.

No. 2. *Chrysopogon pallidus*. Being a tall grass with a reddish seed-head, it is sometimes called "red head," a name applied to a number of different grasses in Queensland. Further west it is also known as blue leaf. It has a very wide distribution in the State, and probably finds its greatest development in the Central West, where it forms an important constituent of the pasture in many places. Most graziers report it to be quite good fodder, greatly sought after by sheep, especially in its young stages. When old and dry, that is, after the seed has fallen, the grass is of very little value, but this applies to the great majority of grasses.

Sour or Yellow Grass.

S.H. (Caboolture)—

The grass has been determined as sour or yellow grass (*Paspalum conjugatum*). This grass is a serious pest on the Atherton Tableland. It also appears to be spreading in parts of southern Queensland. Experience in this State shows that it is an inferior grass, and a menace in many districts to paspalum and other good pastures.

Cockspur Thorn.

Querist (Ayr)—

Your specimen is the cockspur thorn, *Cudrania javanensis*. It is a native plant, which is also indigenous to East Africa and Southern Asia. It is somewhat of a pest about Brisbane in vacant allotments, and along roadsides. We have not heard of the fruit being edible before.

Milky Cotton Bush.

J.T.B. (Clifton)—

The plant specimen is red head or milky cotton bush, *Asclepias curassavica*. This is a common weed on very many farms, although it never seems to be prevalent in very large numbers. As it is a poisonous plant, causing gastro-enteritis when eaten, it is mostly avoided by stock. It is a native of South America.

A Native Convolvulus.

T.B. (Dimbulah)—

The vine has been identified as *Ipomoea quinata*, a native plant belonging to the convolvulus family. The species is also found in Burma and southern China. We were very interested to read your remarks about the palatability of this plant and its speedy growth after fires have passed over the country. We are keeping a record of your remarks to be filed away with our specimens in the herbarium.

A Fungus.

F.Y. (Hemmant)—

Your specimen is one of the Star Fungi. It is a species of *Aseroe*, probably *Aseroe rubra*.

Native Rosella.

J.F.B. (Flaggy Rock)—

The specimen has been determined as the native rosella, *Hibiscus heterophyllus*. This plant has not so far been found to be harmful to stock. In most cases it is assumed that it is good fodder. So far as we know, this plant is not likely to be the cause of the death of stock on your property.

A Rattlepod.

Inquirer (Windorah)—

The specimens have been determined as *Crotalaria dissitiflora*, one of the rattle pods, and belonging to the legume family. *Crotalaria striata*, another species of the genus, was found to be poisonous, in the Northern Territory. Although we have no experimental proof, it seems likely that the plant you send may be the cause of the deaths of the sheep. On the whole, stock avoid the crotalarias. This circumstance suggests that these plants are at least unpalatable. Your letter has been referred to the Poison Plants Committee of this Department.

Hop Bush.

J.P.P. (Chinchilla)—

The specimen has been determined as *Dodonaea viscosa*, fairly well known as "hop bush" on account of the winged fruits. We have no records of its being poisonous or harmful to stock. As a matter of fact, it is generally considered to be a good fodder plant. In spite of this, it is, of course, possible that the eating of this plant might have had something to do with the losses of the calves referred to in your letter, which has been referred to the Poison Plants Committee.

"Wild Peach."

E.Y. (Dirranbandi)—

Your specimen belongs to the pittosporaceous plant known botanically as *Citriobatus pauciflorus*. In the Dawson Valley it is sometimes called "Wild Peach," probably on account of the appearance of the fruit. It is a native species. We have no data as to the edibility of the fruit.

Tick Trefoil.

Inquirer (Townsville)—

The specimen from the Tully district is a tick trefoil (*Desmodium triflorum*). This is a leguminous plant, and is mostly looked upon as a good fodder. Its chief disadvantage is that it is very small and very low-growing, so that it provides very little growth which can be eaten off by dairy stock. It is recorded as common in different tropical parts of the world. So far as we have observed, it is very well established in many coastal parts of the State, from the New South Wales border up to Cairns.

Kaffir Plum.

A.H.B. (Nambour)—

Your specimens are from the Kaffir Plum, an ornamental species with an edible fruit and a native of South Africa. It is commonly planted in gardens in Queensland. It is known botanically as *Harpephyllum caffrum*.

Rural Topics

A Duck's Diet.

The gizzard of a duck found dead in a farmyard in Devon, England, contained two pieces of wire 3 inches long, several parts of a razor blade, a wire nail, a lump of glass, and a large assortment of brightly coloured scraps of pottery, glass, and stone. No wonder it dodged the kitchen axe!

The Cow "Wired In"—Remarkable Veterinary Surgery.

When a cow owned by an Indiana (U.S.A.) farmer became violently ill recently, the veterinary surgeon who was called in to examine her removed a rib and found that a 3-inch piece of barbed wire had worked its way from the cow's stomach to the heart. He cut out the wire, sewed up the wound, and now she is as good as new.

Bulls on the Bucket.

On a property in the Argentine, bulls are not weaned until they are two years old. At feeding time, the huge animals, some of them weighing three-quarters of a ton each, and all of them matured, are tied to racks where they feed like unweaned calves on a succession of cows. Each bull drinks about 30 quarts of milk a day and requires two to three "foster mothers" at a feeding. When they are two years old, the bulls are graduated to a diet of carefully-mixed grain.

Cocktails in the Fowlhouse.

Strutting roosters and waddling hens step right up and demand a cocktail on the house at a poultry farm near Cedar, Iowa (U.S.A.). The cocktails, however, are made of tomato juice. The farmer's wife claims that the bottled sunshine, which she puts up in the autumn, keeps her flock free from roup and other ailments, and produces hardier chicks.

Farmers become Air-minded.

Farmers in some parts of the United States have used aeroplanes for marketing, for sowing and dusting crops, and even for mustering cattle. Now the market gardeners of Delano, California, are using an aeroplane as a flying scarecrow. Despairing of controlling flocks of sparrows which were ravaging their lettuce crops, they recently chartered a plant to roar over their fields for six hours daily. The birds couldn't stand the racket, and went off the lettuce diet—science marches on!

Hidden Wealth—A Slab of Farm Philosophy.

Many of us are familiar with the fable of the hidden fortune left by the old farmer to his more or less shiftless sons. The wise old man failed to specify the exact place where the treasure could be found, so the sons proceeded to dig up the earth with great energy until finally they had gone over the best of the fertile, untilled fields and still no pot of gold had been uncovered. In despair, they gave up looking for the easy money left by their departed parent. Then they suddenly realised that the land they had turned over was ready for a crop. From that crop an abundant harvest was reaped, and then the sons awakened to the fact that they had stumbled on the hidden wealth left to them by the old man.

The obvious moral of that old yarn is that there is hidden wealth to be uncovered in every district. It is no good trying to find it with a divining rod. What are needed are the firm hands and strong arms of the willing worker directed by an alert mind and backed up by a co-operating community. Around us is a great abundance of many kinds of material ready to be put to good and profitable use—lands, for instance, which are calling for proper cultivation, and, most important of all, labour of varying degrees of skill which is not fully employed to the best advantage.

A thousand outside influences help to colour the life of a community. We should not ignore them, for we cannot afford to lose the advantages they make possible for us, but the pot of gold is not behind the distant green hills—it is in the soil at our feet.

A Drastic Penalty.

A Scottish farmer was recently fined the maximum penalty of £10 for having failed to seal twelve milk cans before delivering them to a motor haulage contractor for transit.

Mankind a "Biological Nuisance."

In a characteristic utterance at the Science Congress at Canberra, Mr. H. G. Wells said that from the earliest time man appears as "a biological nuisance to himself as well as to the rest of living things. He cuts down trees, he destroys soil, and he acclimatises destructive animals. A map of the world showing the devastated regions due to mankind would amaze most people. In the last hundred years you have seen great regions of the United States turned into a desert, you have seen Australia swept by weeds and rabbits, you have seen a slaughter of useful animal species, you have seen a monstrous destruction of natural resources, and your old history teaching does nothing to awaken the minds of the coming generation to the gravity of this process."

The Farm and the Town—An Economic Combination.

Happily with a better understanding of each other's place in the scheme of things, the farmer and the townsman are both realising how much each depends on the other economically. We could never make any real progress in the economic field without mutual confidence between the producer of primary products and the producer of secondary industry, for, apart from those engaged in supplying services, they are the chief components in what is called the body politic. Without co-operation between those engaged in rural and urban industry, and a complete understanding of each other's viewpoint, our economic system could not function properly and the active advancement of the country would be retarded.

Each section of the community has its share to contribute to the welfare of the whole, each has a definite influence on our national life, and each is entitled to a fair reward for its contribution.

The plain fact is that neither the producer nor the consumer can exist without the other; and his home market—that is the market provided by the town dweller—is the farmer's best market.

Health and Agriculture.

The most hefty obstacles to progress in nutrition and health are, it is said, poverty and ignorance. To these, however, must be added the national fears on which plans for "self-sufficiency" are based, and these plans have increased the prices of protected foodstuffs, lowered the standards of living, and hampered international trade. It is believed that governments, by raising the level of nutrition and increasing the consumption of foodstuffs can indirectly revive international trade and promote agricultural production. Some governments, including those of Australia and Great Britain, are now taking steps to do so. If such policies were pursued vigorously and generally, the primary producer as well as the community in general would benefit considerably. A "marriage of health and agriculture" would end—or help to end—the sterile restriction of production. This is what the last report on nutrition from Geneva says:—"The malnutrition that exists in all countries is at once a challenge and an opportunity—a challenge to men's consciences, and an opportunity to eradicate a social evil by methods which will increase economic prosperity."

Changing Trends in Agricultural Research.

Pressing problems have given renewed impetus to agricultural research. The whole world is in a state of flux, and almost overnight, so to speak, we are faced with an entirely new set of problems.

One of the most marked changes in our thinking which has been brought to the point of action is in regard to the necessity for conservation and the wise use of our land resources. This has led to greater need for emphasis on research in agricultural economics. More time and attention has to be given to soil surveys and soil studies, because the information in this field has much to do with the long-time soundness of changes in land use; to pasture and fodder crop research; to crop improvement; to new uses for agricultural products; to erosion investigations; to reforestation; and to marketing and distribution.

The Romance of the Queensland Dairy Industry.

Having to milk as usual every morning convinces us of the realism rather than the romance of dairying; still, the realism of bail and bucket may be forgotten for a moment to contemplate the romance of achievement. Here it is:—In the lifetime of men still comparatively young the Queensland dairy industry has grown to become one of the main sources of the State income. This year it is actually worth, in round figures, more than ten millions (£10,000,000) to Queenslanders.

Farm Notes

AUGUST.

AUGUST is normally a dry month throughout the State, but where good soil moisture exists the advent of warmer weather will cause weed growth to increase, necessitating the use of cultivators in growing crops and land being prepared for maize, cotton, sorghums, and other crops.

Well-worked land having reserves of subsoil moisture is essential for satisfactory subsequent growth, as spring sown crops often have to withstand moderately dry conditions until the occurrence of early summer storms.

In coastal districts where frost is not liable to occur, early sowings can be commenced of maize, sorghums, millets, sudan grass, pumpkins, and melons, together with the planting of arrowroot, artichokes, sweet potatoes, &c., but unless ample soil moisture is present, there is little to be gained by very early sowings before the soil is sufficiently warm, as later-established areas will often make rapid growth, equalling or excelling that of earlier sowings.

Potato planting will be carried on in the Downs, South Burnett, and other areas away from the coast, where July plantings are likely to be affected by frost, the bulk of the spring crop being established during July and August.

Potatoes show a partiality to thoroughly prepared virgin soils, more especially deep, friable well-drained alluvial loams and scrub soils, which indicates that the maintenance of a supply of humus in the soil is essential for profitable yields.

Seed potatoes for this crop are usually procured from the Southern States, where certified seed true to varietal type is now available, but to prevent seed-borne disease all seed should be treated either by the hot formalin or corrosive sublimate methods, full particulars of which are obtainable from the Department. Whole sets are preferable, but cut sets may be used for the spring planting, dusting the cut surfaces with wood ashes or slaked lime shortly after cutting.

Dairymen in many districts will now be utilising early sown winter fodder crops to maintain production, and where crops are grazed, temporary subdivision will prove valuable in conserving growth and providing fresh pastures at frequent intervals.

On the Downs the grazing of wheat areas, intended ultimately for grain, should cease by late July, otherwise probable yields are likely to be considerably reduced.

Orchard Notes

AUGUST.

THE COASTAL DISTRICTS.

IN many centres the bulk of the citrus fruits, with the exception of the late-ripening varieties, will have been harvested, and cultural operations should be receiving attention.

Trees which show indications of impaired vigour will require a somewhat heavy pruning, both in respect to thinning and shortening the branches. Where the trees are vigorous and healthy a light pruning only will be necessary, except in the case of the Glen Retreat mandarin. The densely-growing habit of this variety leads to a profusion of weak shoots, which, if allowed to develop, will cause overbearing with resultant small and inferior fruit at an early age.

Where trees show signs of failing, investigations for the presence of collar rot should be made at or near ground level. The roots should be examined for disease, and in the North Coast districts for the presence of the citrus root bark channeller. A light application of paradichlorobenzene buried a few inches deep in circular drills arounds the tree and with the surface stamped firmly has been recommended for controlling this pest. The distance between the circular drills should be not more than 18 inches, and care should be taken to prevent the crystals of paradichlorobenzene from coming into contact with the roots. It may be necessary to repeat the application after an interval of three or four weeks.

Where it is necessary to control black spot, melanose, scab, and brown spot of Emperor mandarins the fungicide should be applied at the correct time. The control measures recommended are—

For Scab and Melanose.

Colloidal copper (3-40) or Bordeaux mixture (3-2-40) + 1 per cent. oil emulsion when half to three-quarters of the blossom has fallen.

For Black Spot.

(1) As above;

(2) Repeat the spraying at similar strength two months later.

For Brown Spot of the Emperor Mandarin.

(1) As for black spot;

(2) As for black spot;

(3) Repeat the spraying at a similar strength in late February.

Where for any reason healthy trees of vigorous constitution are unprofitable, they may be headed back—in fact, have the whole of the top removed—leaving a few selected arms. All other branches should be cut away at their source of origin. The three or four remaining arms, of which lengths will vary from 2 to 4 feet, will form the future framework of the tree. Care must be taken to cover the whole of the exposed bark with a suitable coating of whitewash to prevent sunburn. The numerous shoots which will grow from main arms should be suitably reduced, leaving from two to four on each arm. Under favourable conditions, these will be in a fit condition to receive selected buds from desirable trees by the following autumn. It is desirable that when shoots intended for budding have attained a length of from 6 to 9 inches, their terminals should be nipped off in order to stiffen their growth and guard against the possibility of damage by strong winds.

Fertilizing should be completed as early as possible, the mixture for the spring application being high in readily available nitrogen. Ploughing should then be completed, the depth being regulated by local conditions and the nature of the original preparation of the land. Following the ploughing, the land should be worked down to a fine state of tilth. On hillside orchards, attention should be given to the care of possible storm waters. Cultivation should be so arranged as to form shallow drains or banks along the tree rows and across the heaviest slope, leading into suitable side drains which may be grassed to prevent erosion.

The planting of trees may be continued and, with the exception of custard apples, expedited. The attention of citrus growers should be confined to varieties suited to their local conditions.

The pruning of grape vines should be completed, and where cuttings for planting are required these should be selected, trimmed, and heeled-in in slightly dry soil. Canes intended for cuttings should not be allowed to lie about and dry out, but should be treated the day they are severed from the plant. Cuttings are frequently made of excessive length. From 10 to 12 inches is a suitable length which allows for insertion in the soil so as to permit of the top bud, with a short section of the internode, protruding above the surface.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

ALL pruning other than that applied to peaches and varieties which are late in coming into growth should be completed this month, and the planting of young trees, if not already done, should no longer be delayed. Early planting is preferred, the sooner after the fall of leaves the better. When there are indications of the swelling of the buds, the time is opportune for working over unprofitable trees, where the stock is reasonably vigorous. Strap grafting, as advised by the local field officers, is the most satisfactory method of top-working deciduous trees.

The pruning of vines should be postponed as long as circumstances permit, and these can only be gauged on actual observation as they are subject to much variation.

The usual winter working of the land is essential for the retention of moisture and aeration of the soil, but in shallow soils in which many orchards are planted deep working is most detrimental. The matter of seedling stocks for apples and the inferior plants frequently received from Southern nurseries prompts a query as to how many seeds have been stratified for spring planting, and whether any effort is being made towards raising a local supply of nursery stock.

HANDY BOX FOR TOOLS.

In the old days carpenters used a hand basket for carrying the tools they needed on the job. A box is handier and can be made from stuff picked up around the place. The sides are best of thin material. For carpenter's tools it is best made long enough

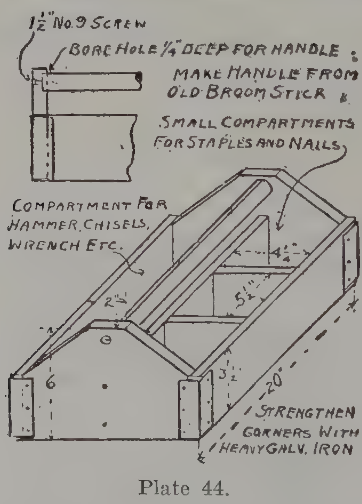


Plate 44.

to take a saw, though this is not absolutely necessary. The box shown is 20 inches over all, and has corners reinforced with sheet iron. The sides are $3\frac{1}{2}$ inches deep, and the ends at the highest point 6 inches. The width is about 10 inches. One side is divided into compartments for nails and staples.

Our Babies.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

PREVENTION OF INFECTION.

WINTER INFECTIONS.

COUGHS and colds and sore throats occur all the year round, but are more common at this time of the year. Although these infections are mild in the majority of cases, they may interfere temporarily with the child's appetite and nutrition, as well as with his sleep, making him restless and fretful. Occasionally the infections are serious, or they may be accompanied by serious complications, particularly in the case of young children.

How Infections are Spread.

It is most important that mothers should understand the cause of these infections and how they are spread. They are caused by disease germs and are spread from one person to another—

Firstly, by those persons suffering from mild attacks of the infection.

Secondly, by those persons who are convalescent from an attack and are able to go about while harbouring the germs.

Thirdly, by those persons who appear well, but who are carrying germs in their noses and throats.

When these persons cough or sneeze, or even speak, these germs are expelled into the surrounding air.

Dwellings, public buildings, and conveyances are often poorly ventilated in the cold weather, hence the air tends to become more polluted than it is in the warm weather when ventilation is generally good.

"Colds" are not Caused by Cold.

A drop in the temperature in itself will not cause a cold, providing the body is adequately clothed and is not subject to sudden chilling. Chilling temporarily lowers the resistance and will predispose to illness when the germs of the disease are being carried by the child. The chilly feeling experienced at the onset of an attack is part of the disease process not its cause. It may be stated, therefore, that winter infections are not caused by going into the fresh air but by being confined in badly ventilated buildings or rooms with persons carrying the germs of infection.

Smearing.

A method of spread common amongst young children is that of putting their fingers into their mouths and noses and transferring secretions containing germs to the hands and mouths of other children.

Cause of Illness.

Whether exposure to infection will cause illness or not depends upon two things.

First, the child's resistance or the power of his body to kill or disable the germs.

Second, the massiveness of the infection or the number of germs making the attack and the virulence or strength of each.

With good resisting power a child may resist an infection unless the germs are massed in sufficient numbers, or are sufficiently virulent to overcome his resistance.

To Increase Power of Resistance.

The child's general resistance can be built up by attending to his general management and feeding. The breast-fed or naturally-fed infant has better resistance than the infant who is fed artificially or unnaturally. The resistance of the older child is increased by feeding him on a balanced diet containing such food as milk, butter, cheese, whole meal or wheat germ bread, marmite or vegemite, eggs, fish, meat, fresh vegetables and fruit according to his age. The addition of cod liver oil emulsion is useful, particularly in the case of the poorly nourished child and in cold weather.

Resistance to specific or particular infections is brought about by methods such as immunisation against diphtheria, vaccination against smallpox.

To Diminish Power of Attack.

Reference to the importance of good ventilation has already been made. Ventilation provides us with a means of dividing up the invading hosts of germs, and thereby rendering their attack less effective. Young children, and particularly babies, should not be taken into crowded buildings or be allowed to associate with older children and adults who are suffering from obvious infections, such as coughs, colds, and sore throats. When the mother or other attendant is the person affected she should avoid coughing or sneezing into the child's face. Many persons suffering from coughs and colds thoughtlessly neglect to use handkerchiefs.

No child should be exposed to infection unnecessarily. There was a time when mothers deliberately exposed their children to certain infections with the idea of allowing them to develop the diseases and thus acquire immunity. This procedure would be a sound one, if the dose and the strength of the germs causing the infection could be controlled.

Cultivate a Public Health Conscience.

In the interests of those children who are well, a child suffering from an infection should not attend a nursery school or kindergarten or any other school. He should not be taken to a baby clinic, where he will came into contact with babies and older children who are well and whom the nurses are doing all they can to protect from infections and keep well. The clinic nurses are trained to advise mothers in regard to the general care and management and the correct dieting of children up to school age, with the object of building up their resistance to infections.

There are still those who think that clinics are institutions to which sick children should be taken. These children should attend the hospitals, or go to their own doctors for advice.

You may obtain information on all matters concerning infant and child welfare by visiting the nearest clinic, or by writing to the sister in charge, or by communicating direct with the Baby Clinic and Child Welfare Training Centre, Alfred street, Valley, N.1, Brisbane.

IN THE FARM KITCHEN.

STEAMED PUDDINGS.

At this time of the year steamed puddings are always welcome additions to the menu. Here are a few simple and tested recipes:—

Sago Plum Pudding.

Take 3 tablespoonfuls of sago, 1½ gills hot milk, ½ cupful breadcrumbs, ¾ cupful stoned raisins or sultanas, ½ cupful sugar, 2 oz. butter, 1 egg, ½ teaspoonful bicarbonate of soda, toffee sauce.

Wash the sago and strain it. Pour the hot milk on the sago and let it stand for three hours. Add the raisins to the sago with breadcrumbs, sugar, and butter. Put the mixture into a saucepan and heat it till the butter is melted. Beat the egg with the soda and stir it in. Pour into a mould which has been well greased and twist a greased paper over the top. Steam for two hours. Leave the pudding for three minutes before turning out. Pour toffee sauce round and serve.

Toffee Sauce.

Take 2 oz. butter, ¾ lb. golden syrup, ¾ lb. brown sugar.

Melt the butter and add the sugar and syrup, stir till it boils. Boil it for fifteen minutes. Stir till it begins to thicken and pour it quickly round the pudding.

Roly-poly with Nut Filling.

Take ½ lb. flour, ¼ lb. suet, 1 flat teaspoonful baking powder, water to mix, 2 tablespoonfuls golden syrup, 2 oz. breadcrumbs, ½ flat teaspoonful ground ginger, 1½ oz. shelled Brazil nuts (or other suitable nuts).

To make the filling, warm the syrup in a saucepan, then stir in the breadcrumbs mixed with the ground ginger, also Brazils (previously put through a mincer). Mix all together, then leave to cool. Chop the suet finely and mix with the flour and baking powder, add water gradually, and mix to a dough. It must not be at all sticky. Turn on to a floured board and roll to an oblong shape (not too thin). Then turn on to the other side and spread over the prepared filling, leaving a good margin all round. Damp the edges and roll up, pinching it well together at either end; then roll in a scalded and floured pudding cloth and tie securely. Put into boiling water and boil for about one and a-half to two hours.

Tricolour Pudding.

Take ¼ lb. flour, 1 oz. cleaned currants, 2 oz. margarine or butter, 2 tablespoonfuls sugar, cochineal, ½ oz. cocoa, 1 egg, 1 dessertspoonful sugar extra, vanilla essence, ½ teaspoonful baking powder, ½ cupful milk, jam sauce.

Grease a basin and put the currants at the bottom. Put some water on to boil. Cream the margarine and sugar till soft and beat in the egg. Add the flour, milk, and baking powder. Leave one-third of the mixture in the bowl used for mixing and do not colour it. Put one-third of the mixture into another bowl and stir into it the cocoa mixed with the dessertspoonful of extra sugar. Add a few drops of vanilla. Put one-third of the mixture into a basin and colour it red with cochineal. Take dessertspoonfuls of the red, white, and brown mixtures alternately and put them in the greased basin, which should be little more than half full. Cover the mixture with greased paper and stand it in a saucepan containing enough boiling water to come half-way up the basin. Steam steadily for one hour. Pour jam sauce round, and, if desired, decorate with cream.

Jam Sauce.

Take ½ cupful raspberry jam, juice of a lemon, ½ pint water, a little cochineal, 1 tablespoonful sugar, ½ dessertspoonful cornflour.

Put the jam, lemon juice, and sugar in a small pan, add half the water and boil up. Mix cornflour to a smooth paste with remainder of the cold water and pour the boiling sauce on to it, stirring well. Return it to the pan and stir till it boils. Add a little cochineal. Simmer for ten minutes and strain.

Steamed Pineapple Pudding.

Take 3 oz. stale sponge cake, small tin pineapple, 3 dessertspoonfuls sugar, 2 eggs, 1½ gills milk.

Drain the pineapple. Put it through the mincer, and then make it up to half a pint with some of the syrup. Crumble the sponge cake finely and mix with the prepared pineapple. Separate the eggs. Beat up the yolks, add the milk, then stir into the pineapple, &c., with the sugar. Whisk the egg-whites to a very stiff froth and fold in lightly. Turn the mixture into a well-buttered mould, cover securely with a buttered paper, and steam for about one and a-half hours. The water should simmer, not boil fast, and should not reach more than half-way up the mould. When cooked turn out carefully and serve hot or cold. If liked, the remainder of the syrup can be heated and coloured with a few drops of cochineal and poured round the pudding.

Cardinals.

Take 1 tablespoonful butter, ½ teacupful soft sugar, 1 teacupful flour, ½ teaspoonful baking powder, pinch salt, 6 dessertspoonfuls jam, 2 eggs.

Soften the butter in a basin, add the sugar, and beat well again. Mix the flour, baking powder, and salt together and stir into the mixture. Have six small moulds well buttered, put a dessertspoonful of jam in each (apricot jam is excellent for this), half fill the moulds with the mixture, place them in a saucepan with about an inch of boiling water, and steam for half an hour. Serve at once.

Delicious Plum Pudding.

Take 5 tablespoonfuls plum jam (stoneless), ½ lb. breadcrumbs, 1 lemon, ¼ lb. suet, 1 egg, milk to mix.

Make the breadcrumbs. Grate the lemon rind and add. Chop the suet finely and mix it with the breadcrumbs. Beat up the egg. Squeeze the lemon and strain the juice. Put the jam in the centre of the dry ingredients, add the lemon juice, and mix with some of the breadcrumbs, &c. Add the egg with some milk as required and mix all together. Put into a greased pudding basin, cover securely with a greased paper and steam for about two hours to two hours and a-half. Turn on to a hot dish, dredge with castor sugar, and serve.

Golden Pudding.

Take 6 oz. flour, 6 oz. suet, ¼ lb. sultanas, ½ flat teaspoonful bicarbonate of soda, 6 oz. breadcrumbs, 6 oz. syrup, a little grated nutmeg, 1 egg, milk and water to mix about 1½ to 2 gills.

Wash the sultanas, rub in a cloth, remove stalks and dry them well. Mix the soda with the flour and sieve through into a basin. Make the breadcrumbs. Skin and finely chop the suet. Add these together with the sultanas and grated nutmeg

to the flour; mix well. Beat up the egg, add the syrup, and whisk together. Then add to the dry ingredients with sufficient milk and water to make a rather wet mixture. It should be about the same consistency as a cake. Put into a greased basin, cover with a greased paper and floured pudding-cloth and steam for two and a-half to three hours. Turn on to a hot dish and serve with golden sauce around it.

Golden Sauce.

One gill syrup, ½ gill water, 1 tablespoonful lemon juice.

Boil all together for five minutes and pour round the pudding.

SOME SPONGE MIXTURES.

This simple sponge mixture can be used in at least twelve different ways for cakes and steamed or baked puddings.

Take 2 eggs, their weight in butter, sugar, and flour.

Cream the butter and sugar, beat up the eggs, and add separately, mixing in thoroughly. Mix in a little flour at a time, also a small teaspoonful of baking powder if plain flour is used. Beat up thoroughly. This mixture can be put in a buttered basin and steamed for one and a-half to two hours, or baked in a buttered pie-dish for three-quarters of an hour to one hour. As a cake it takes about one hour in a moderate oven.

Treacle Sponge.

Put two tablespoonfuls of syrup at the bottom of pie-dish or basin.

Ginger Sponge.

Add two level teaspoonfuls of ground ginger to the flour. Serve with vanilla sauce.

Cherry Sponge.

Cut up two or three ounces of glace cherries and add to mixture. Serve with custard sauce.

Marmalade Sponge.

Put two tablespoonfuls of marmalade at bottom of basin or pie-dish.

Sultana Sponge.

Four ounces of sultanas, raisins, or currants, or all mixed added to sponge mixture.

Date Sponge.

Four ounces of dates are added. These two puddings take a little longer to cook, and if more fruit is added still longer cooking will be required.

Coffee Sponge.

Add one tablespoonful of coffee essence to mixture, and a little extra flour. Serve with white sauce flavoured with coffee or cream.

Chocolate Sponge.

Add a good tablespoonful of cocoa and a little extra sugar or chocolate powder without extra sugar to the flour. Serve with chocolate sauce.

Orange Sponge.

Grate rind of two oranges into mixture and mix well. Serve with white sauce flavoured with juice of one orange.

Lemon Sponge.

Same as orange with a little more sugar added to sauce.

Peach Sponge.

Drain the juice from a tin of peaches, cut up small, and place in bottom of pie-dish. Pour sponge mixture over. Any tinned, stewed, or fresh fruit, drained of juice, can be used for this pudding.

Strawberry Sponge.

Mix enough cochineal into the mixture to colour it pink. Put two tablespoonfuls of strawberry jam at the bottom of the basin. All these mixtures except the treacle, marmalade, jam, and peach can be baked as cakes.

TREE VALUES.

"Waratah," the well known *Sydney Morning Herald* writer, has the subjoined appreciation of tree values in a recent issue of that journal—

In city, country towns, and right out-back, interest in trees grows steadily, as their value for decoration, as shade givers, and as general beautifiers becomes more known and appreciated.

For home garden, street, and park use intensive research is now going on for the best and most suitable varieties to give long and worthy service.

Growers from farm and station have joined the quest for tree beauty in foliage and line and flower, which transforms homesteads as well as the garden plots of suburban allotments.

Some tell me that they have no room for trees in "small gardens," because the roots are voracious and the branches throw shadows over precious space where annuals and other colour-makers are growing.

To that, I reply that my own garden was built on an ordinary home plot of 50 feet x 200 feet, and it contains trees, mostly small—but also a few large—growing in perfect harmony with shrubs and roses and annuals. The contemplation of this finished outlay is one of the real pleasures of life. There is always something happening—this or that shrub is blooming and another tree is in bud, ready to show its glory. . . . Needless to say, the birds love these little touches of introduced bushland beauty, as I do, and a friendship is born of the questing in quiet corners.

Sometimes they scold me—these feathered visitors—when they are searching for honey, which is abundant at flowering time, but mostly they know that we have a dual kinship with nature and a respect for the rights of smaller living things.

But we set out to talk about trees, and I must tell of those which give me so much joy as they progress on this small holding.

There are two Jacarandas; both are in the growing-up stage. Bauhinia purpurea is another small-tree colourist which I cherish, as its springtime purple cloud of bloom rivals the Jacarandas.

The Cape Chestnut (*Calodendron capense*) finds a place for its grand work when in the mood, and a Virgilia has given some splendid colour pictures on hot summer days. . . .

I cannot imagine any garden which I may make consisting merely of small shrubs and beds of annuals—even of the gayest colours—or of lawns and roses, without my beloved trees and tall shrubs. . . .

The trees and shrubs in my garden form a nice background setting for the rose garden, and they hide the obtrusive fences effectively. Neighbours' feelings are not outraged by intruding roots and overhanging branches, either, because most of the larger subjects are well out of the way.

A few tall trees and shrubs are against the western fence, where their shade is gratefully accepted "next door," and these are rather deep or tap-rooters. It is all a matter of collaboration.

"All this is very interesting," a country friend reminded me, when he heard the recital, "but how does it help us outback? There are not any varieties mentioned for our conditions, and country gardens need trees or shrubs, large or small, for breakwinds, shade, and beauty."

SALT FOR WORKING HORSES.

A good farm horse is well worth his feed. Most farmers realise this, but all too frequently plough horses may be seen licking the dried sweat from each other.

Working horses are incapable of sustained effort without a liberal supply of salt, and when the food is low in this mineral they try to remedy the deficiency by licking the saline deposit from evaporated sweat round the collar, saddle, and other gear of a team mate.

It is, therefore, sound practice to keep rock salt in a convenient place for working horses.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1939 AND 1938, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of years' records.	May, 1939.	May, 1938.
	In.		In.	In.
North Coast.				
Atherton	2·23	38	2·69	1·38
Cairns	4·50	57	2·63	3·19
Cardwell	3·61	67	1·55	2·98
Cooktown	2·79	63	0·71	1·40
Herberton	1·72	53	0·80	0·44
Ingham	3·72	47	2·85	7·90
Innisfail	12·39	58	11·33	10·52
Mossman Mill	3·77	26	0·96	1·88
Townsville	1·26	68	0·45	0·39
Central Coast.				
Ayr	1·08	52	0·12	..
Bowen	1·26	68	0·60	0·11
Charters Towers	0·77	57	0·23	0·43
Mackay P.O.	3·78	68	6·28	4·17
Mackay Sugar Experiment Station	3·32	42	7·11	4·11
Proserpine	4·22	36	3·46	2·67
St. Lawrence	1·75	68	0·75	1·95
South Coast.				
Biggenden	1·77	40	1·32	5·80
Bundaberg	2·64	56	0·84	7·53
Brisbane	2·82	87	1·35	11·81
Caboolture	2·99	52	2·30	14·20
Childers	2·17	44	0·91	6·32
Crohamhurst	5·08	46	4·31	21·91
Esk	2·05	52	0·93	9·78
South Coast—contd.				
Gatton College	1·60	40	..	6·39
Gayndah	1·58	68	0·28	4·03
Gympie	2·84	69	1·35	8·77
Kilkivan	1·85	60	1·57	4·98
Maryborough	3·00	68	2·15	6·62
Nambour	5·10	43	4·77	26·71
Nanango	1·54	57	0·49	4·50
Rockhampton	1·60	68	1·41	2·34
Woodford	3·03	52	2·61	15·23
Central Highlands.				
Clermont	1·31	68	0·37	5·32
Gindie	0·93	40	..	3·88
Springsure	1·24	70	0·82	3·07
Darling Downs.				
Dalby	1·29	69	0·01	2·25
Emu Vale	1·15	43	0·12	2·87
Hermitage	1·18	33	..	3·56
Jimbour	1·18	51	0·20	1·13
Miles	1·52	54	1·09	6·24
Stanthorpe	1·79	66	0·55	2·53
Toowoomba	2·18	67	1·38	6·75
Warwick	1·51	74	0·08	3·59
Maranoa.				
Bungeworgorai	0·97	25	..	5·43
Roma	1·44	65	0·49	8·10

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—MAY, 1939.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Coastal.									
Cooktown	29·94	81	69	82	1, 11-13, 16-18, 20-22	60	31	71	6
Herberton	..	72	56	76	16, 17	47	5	80	11
Rockhampton	30·08	79	62	85	21	50	25	141	8
Brisbane	30·16	74	58	81	22	51	30	135	13
Darling Downs.									
Dalby	30·18	75	48	80	20	35	25	1	1
Stanthorpe	..	67	44	73	21	30	24, 25	55	7
Toowoomba	..	69	53	75	22	43	1	138	11
Mid-Interior.									
Georgetown	29·98	87	60	91	17	50	4	..	..
Longreach	30·07	83	56	88	2	46	25	7	1
Mitchell	30·15	75	46	81	22	33	25	34	2
Western.									
Burketown	29·98	88	63	93	17, 18, 19	58	27	..	..
Boulia	30·10	83	56	89	10	45	25	..	..
Thargomindah	30·11	78	51	83	11	42	25, 26	87	2

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	July, 1939.		August, 1939.		MOONRISE. July, 1939.	MOONRISE. Aug. 1939.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	6·46	5·6	6·35	5·21	4·53	6·17
2	6·46	5·7	6·34	5·22	5·48	7·6
3	6·46	5·7	6·33	5·23	6·39	7·54
4	6·46	5·8	6·33	5·24	7·32	8·50
5	6·45	5·8	6·32	5·25	8·21	9·39
6	6·45	5·9	6·31	5·26	9·14	10·33
7	6·45	5·9	6·31	5·26	10·4	11·28
8	6·45	5·9	6·30	5·27	10·56	a.m.
9	6·44	5·10	6·29	5·27	11·47	12·23
10	6·44	5·10	6·28	5·28	..	1·19
					a.m.	
11	6·44	5·11	6·28	5·28	12·42	2·20
12	6·43	5·11	6·27	5·29	1·36	3·17
13	6·43	5·12	6·26	5·29	2·36	4·13
14	6·43	5·12	6·25	5·30	3·34	5·6
15	6·42	5·13	6·24	5·30	4·37	5·57
16	6·42	5·13	6·23	5·31	5·34	6·43
17	6·42	5·13	6·22	5·31	6·29	7·27
18	6·41	5·14	6·21	5·32	7·20	8·11
19	6·41	5·14	6·20	5·33	8·7	8·55
20	6·41	5·15	6·19	5·33	8·52	9·38
21	6·40	5·15	6·18	5·33	9·35	10·21
22	6·40	5·16	6·18	5·34	10·16	11·8
23	6·40	5·16	6·17	5·34	10·57	11·58
						p.m.
24	6·39	5·16	6·16	5·34	11·40	12·49
					p.m.	
25	6·39	5·17	6·15	5·35	12·24	1·38
26	6·38	5·17	6·14	5·35	1·11	2·31
27	6·38	5·18	6·13	5·35	2·0	3·22
28	6·37	5·18	6·12	5·36	2·52	4·12
29	6·37	5·19	6·11	5·36	3·41	5·4
30	6·36	5·19	6·10	5·37	4·34	5·55
31	6·36	5.20	6·9	5·37	5·26	6·46

Phases of the Moon, Occultations, &c.

1st July	○	Full Moon	4 16 p.m.
9th ,,	☾	Last Quarter	7 49 p.m.
17th ,,	●	New Moon	7 3 a.m.
23rd ,,	☽	First Quarter	9 34 p.m.

Perigee, 18th July, at 9.0 a.m.
Apogee, 5th July, at midnight.

Mercury rises at 8.22 a.m., 1 hour 36 minutes after the Sun, and sets at 6.48 p.m., 1 hour 42 minutes after it, on the 1st; on the 15th it rises at 8.15 a.m., 1 hour 33 minutes after the Sun, and sets at 7.16 p.m., 2 hours 3 minutes after it.

Venus rises at 5.26 a.m., 1 hour 10 minutes before the Sun, and sets at 3.48 p.m., 1 hour 18 minutes before it, on the 1st; on the 15th it rises at 5.37 a.m., 1 hour 5 minutes before the Sun, and sets at 4.14 p.m., 1 hour 5 minutes before it.

Mars rises at 6.59 p.m., on the 1st, and sets at 8.45 a.m., on the 2nd; on the 15th it rises at 5.48 p.m., and sets at 7.45 a.m., on the 16th.

Jupiter rises at 11.52 p.m., on the 1st, and sets at 10.59 a.m., on the 2nd; on the 15th it rises at 10.59 p.m., and sets at 10.56 a.m., on the 16th.

Saturn rises at 1.34 a.m., and sets at 12.54 p.m., on the 1st; on the 15th it rises at 12.44 a.m., and sets at 12.3 p.m.

A noteworthy event of this year will be the opposition of Mars to the Sun, which means that Sun, Earth, and Mars are in a straight line, with the Earth in the middle. In this position exactly they will be on the 23rd of this month, and as Mars travels in an elongated orbit it will, on this occasion, be nearer to us than it has been since 1924, and, therefore, at its greatest apparent size and luminosity. A favourable position for telescopic observation of Mars occurs every 2 years and 2 months, a more favourable every 15 years. It is not recorded that anything new was discovered at the nearest approach of the century in 1924, about the "geometrical lines" seen by some astronomers on the planet, nor of any other signs which would give assurance that Mars could be the abode of intelligent beings. However, at the next opposition, 2 years hence, the greatest telescope in the world may be installed in the Observatory, on Palomar Mountain, in Southern California.

8th Aug.,	☾	Last Quarter	7 18 p.m.
15th ,,	●	New Moon	1 53 p.m.
22nd ,,	☽	First Quarter	7 21 a.m.
30th ,,	○	Full Moon	8 9 a.m.

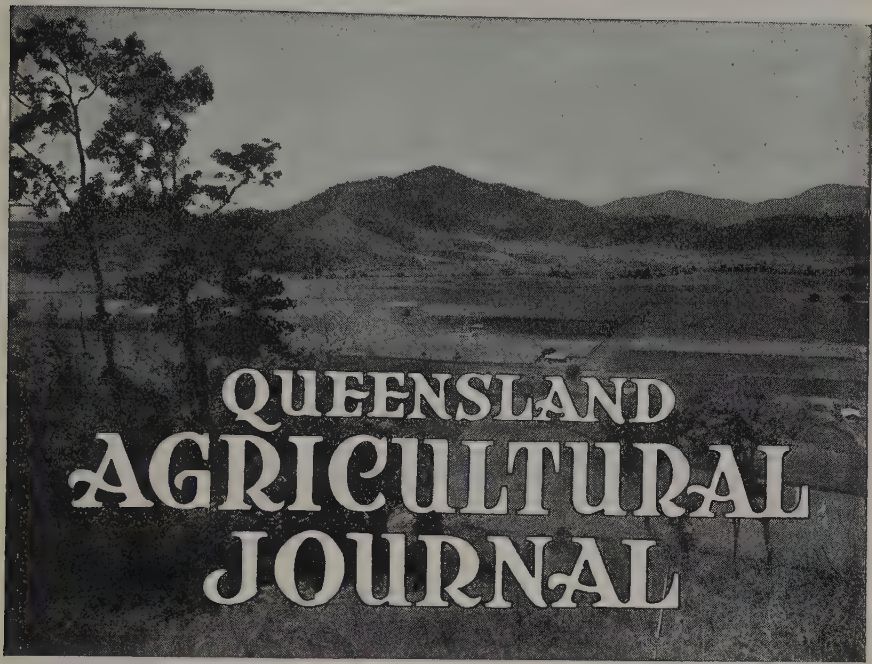
Apogee, 2nd August, at 10 a.m.
Perigee, 15th August, at 6 p.m.
Apogee, 29th August, at 1 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.



Vol. LII. 1 AUGUST, 1939 Part 2

Event and Comment

Efficiency in Agriculture.

IN giving some impressions of his recent investigation of rural problems in South Africa and the two Americas in the course of a Press interview, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, remarked that the agricultural race of to-day will be won by the most efficient countries. "If Australia is to maintain its position in the world's markets," he said, "it will have to plan for increased efficiency." He believes that many of the things he saw in other countries could be incorporated with necessary modifications, in practice in Queensland.

He had come back a better Australian, and convinced that Australia had many advantages over some other countries which he had visited, especially in relation to the colour problem. Australia accepted the White Australia policy as an every-day fact. Australians could not appreciate the colour problem of other lands until they had seen its difficulties, and many times he had felt intensely grateful for the wisdom which had inspired Australia's national policy.

Continuing, Mr. Bulcock said that he had been very deeply impressed with the time and consideration given by all the countries he visited to the economic organisation of agriculture. Bounties in some form were the order of the day. He wondered what would happen to agricultural countries which were without bounties when their goods met those of a bounty country in a common market.

Every country was seeking a solution of the problem of production. Some paid liberal bounties to provide an export market. In some quarters in the United States it was believed that funds devoted to agriculture should be derived from industry, and industry should subsidise agriculture.

Queensland had technicians equal to those he met overseas. It could work out its problems satisfactorily only on that keynote of efficiency.

Los Angeles was the home of agricultural co-operation. He had visited California to discuss its agricultural railway freights, refrigeration of perishable goods, water supply systems, and other matters.

Mr. Bulcock was particularly struck with the way the United States was facing up to its road transport problems. It was an art and a science in designing roads to prevent congestion and carry car traffic with speed and safety. The road programme was an amazing investment of national capital.

Canada was rapidly aligning its interests with those of the United States. A common policy embracing all the Americas was in course of evolution.

From Australian standards, the cost of living was very high in the United States, and in some capital cities in South America, but in the South American interior it was reasonably low. In his contacts throughout his tour he had discovered the international spirit of the agricultural worker.

In a close look at the operation of the New Deal in the United States he found it a broad social experiment to unite for a more equitable distribution of wealth. It aimed to find funds to give employment to what were called the under-privileged people.

At Honolulu he found the famous Waikiki Beach did not compare with those of the Queensland coast. That observation and sights of famous American scenic and tourist resorts en route led Mr. Bulcock to suggest that Australians should see their own country first, before touring abroad.

America, by skilled advertising, drew people from all over the world. If it had the Barrier Reef it would draw people from Mars. Australia had wonderful attractions. America popularised what it had by telling the world about it, but Australia had, apparently, not yet fully realised the potentialities.

Australians Well Off.

SUMMARISED observations of the Minister, based on his overseas tour, are:—

> Australians do not realise how well off they are by comparison with the conditions of people in other countries.
>
> This nation is building towards a destiny as one people—and that could not be said for some countries he visited.
>
> Governments in Australia are closer to the people.

Mr. Bulcock expressed these opinions at a luncheon at which the Queensland Cabinet entertained him on his return to Brisbane.

The Premier (Hon. W. Forgan Smith) said that Mr. Bulcock had seen many things in his travels, and should have an interesting story

to tell when introducing his estimates in Parliament. He would benefit by being able to compare conditions in other countries with those in Queensland. Travel was, without doubt, the greatest of all educators. Much that goes on in life was the result of comparison—comparing conditions in one country with those of another. It was of great advantage to a man to have the opportunity of seeing other countries and acquiring the knowledge they could impart for the advancement of his own land. He had no doubt that Mr. Bulcock had discovered much from which Queensland would benefit.

Mr. Bulcock said that he had seen many things which could, with modifications, be incorporated into the agricultural life of this State. In the Argentine he paid particular attention to the cattle industry, and in Patagonia to sheep. While in the United States he saw many things of deep interest to Australians. The United States was doing a great job in technical research in agriculture, but there were paradoxes, such as huge expenditure to increase efficiency in production, and, within a fortnight, still greater expenditure to restrain production.

He had seen much of government. In Brazil he was invited to see anything he wanted to see. His general impression was that the gulf between governments and people was astoundingly wide; in Australia it was part of the people's life.

Restriction of Production—Will It Become Permanent?

"HAVING seen poverty and want and demonstrations of the problems of competition, I cannot believe that the restriction of production will become a permanent feature of agricultural life. I am inclined to believe that the position ultimately will be that markets shall be to the most efficient, and to those countries which can supply the consumers' needs at the cheapest rate. Therefore, the keynote of things is efficiency." With those observations, Mr. Bulcock concluded an intensely interesting address to the staff of his department at a welcome home gathering. The Minister added that the problems of the Queensland Department of Agriculture and Stock were of a minor nature in comparison with disease and other economic problems of other countries. In South Africa, for example, the stock disease position entailed continuous anxiety and constant vigilance. As a consequence, South Africa had developed a very high standard of veterinary service, and what was probably the greatest animal research station in the world had been established there. This was an institution to which, not only South Africa, but every other stock-raising country was deeply indebted.

In Monte Video, he had seen what is probably the world's best milk supply scheme in operation. In the Argentine the steer was king, and the impression he had gained there was that the steer could not be displaced from its pedestal in the scheme of production. In Brazil, in the course of a 2,000-mile journey, he had become greatly impressed with its agricultural possibilities. He found that a remarkably good job of work is being done there in soil research, and that that country is developing high agricultural standards.

Generally, Mr. Bulcock indicated that he had in the course of his mission abroad obtained at first-hand much information which would be of great advantage to his staff, and of immense benefit to the State.

A. F. SKINNER, Field Assistant.

IT is realised that unrestricted soil losses rapidly reduce crop yields to a point below which they are no longer profitable. In the past due consideration was not always given to the conservation of the soil, with the result that older cultivations bear witness to the fallacy of many traditional farming practices. It is in comparatively recent years only that recognition has been given to the full significance of this menace to the permanency of our soils. Older countries, however, have been compelled to plan and adopt efficient and permanent schemes for soil conservation.

Such schemes, as described in these notes, have been tested under a wide range of conditions and have proved so successful that large additional areas are being stabilised annually at the request of the owners.

Erosion can and must be controlled if the productivity of the soil is to be maintained. Soil erosion by water, as it is widely known, has been defined as "the accelerated transportation of soil particles from their source of origin to a lower and temporary position by the action of running water."

Associated with the occupation of territory by man is the inevitable destruction of much of the vegetative covering designed by nature for the protection of the surface of the earth against the elements. This mantle is fundamental to the preservation of the soil formed in the course of countless centuries. Time and experience have taught that its removal necessitates the substitution of other forms of soil protection.

That the soil is a country's greatest asset and the real basis of national prosperity is axiomatic. Its safeguarding must, therefore, be recognised in Australia, as elsewhere, as a subject of paramount national importance.

Attention is directed towards the extensive damage done to vast areas of farming land in many of the older countries of the world through the lack of realisation of the menace of soil erosion.

In the United States of America and the Union of South Africa particularly, enormous sums are spent annually in mitigating the damage, almost irreparable in some regions, that has already occurred, largely as a result of an unplanned exploitative farming policy. In these countries erosion has removed the surface soil from vast tracts of land which were once fertile and productive. All that now remains of these areas are seemingly illimitable expanses of scarred and barren waste. In many instances, the rate of destruction has gained such impetus that it has passed beyond the possibility of effective reclamation.

It is important that this warning should be heeded in Queensland and active intervention encouraged. In no case can the phrase "prevention is better than cure" be more aptly applied. The work of repair is very slow and, in badly eroded fields, very costly.

Queensland is fortunate in being a comparatively newly farmed country, and if this problem is attacked resolutely and at once serious loss will be averted.

Erosion has already made its mark in most farming districts, and loss of surface soil is continuing, although, in many localities, almost imperceptibly. Accumulations of silt against fences, logs, or on headlands, the filling-up of hollows, the formation of gullies, and muddy and silted watercourses are ample evidences of erosion.

Reduced crop yields are frequently a direct result of the loss of the top soil—loaded as it is with humus, and containing plant foods and beneficial soil bacteria—and not to impoverishment as a result of continuous cropping. Estimates have revealed that from the whole of the cultivated areas in the United States of America more than twenty-one times as much* plant food is removed from the soil by erosion as by crops.

The land is dependent on its top layer of soil for the ready absorption and retention of water—another important factor which obviously affects crop yields.

With the gradual exposure of the subsoil by erosion, effective tillage becomes increasingly difficult and greater resistance is offered to the penetration of roots and moisture. In brief, the top soil may be described as the living surface of the earth.

Erosion by water may be classified as either: (*a*) Sheet erosion; (*b*) gully erosion.

The first form is often a preliminary to gullying and causes heavy losses of top soil in thin layers with almost every heavy rain. In the absence of any protective system providing for the even distribution and drainage of water from the whole field, existing depressions provide the only channels of escape. On cultivated land these shallow channels may develop rapidly into gullies. Gullies may also develop in soft ground from slight mechanical depressions such as wheel tracks. With each successive rain, gullies deepen and gradually extend. Usually, lateral gullies develop at each entrance point of water. The resultant loss of soil and division of the fields are reflected in lower crop yields and reduction of tillage area. In extreme cases fields may become worthless for cultivation through the loss of surface soil in a comparatively few years.

* From "Farm Terracing," by C. E. Ramser, Bulletin No. 1669, U.S.A. Department of Agriculture.

CAUSES OF EROSION.

Running water is the most destructive servant of gravitation in its tendency to reduce the earth's surface to a level plane. Its eroding power is dependent on its volume and velocity. Common practices which assist erosion in its work of destruction are:—

1. Square farming.
2. Cultivating in the direction of the slope.
3. Failure to attend to small "washes" before they develop into large gullies.
4. Bare fallowing.
5. Indiscriminate clearing of timber and undergrowth on steep slopes, catchment areas, and on the banks of watercourses.
6. Failure to practise suitable crop rotations.
7. Insufficient pasture areas.
8. The bringing of fields with a slope greater than 15 per cent. into cultivation.

Most of these contributing factors are bracketed with improper utilisation of land. Careful consideration should, at all times, be given to the layout of fields and pastures, the clearing of new areas, and farming methods. An endeavour should always be made to fit the crop pattern to the natural contour of the land as closely as possible.

THE SOIL-SAVING PLAN.

In planning any complete soil conservation programme, there are problems peculiar to every farm which must be carefully considered by the owner. In no case should the urge for immediate gain to the detriment of the soil-saving plan influence the choice of a programme which may provide for more modest returns over a greater period of years.

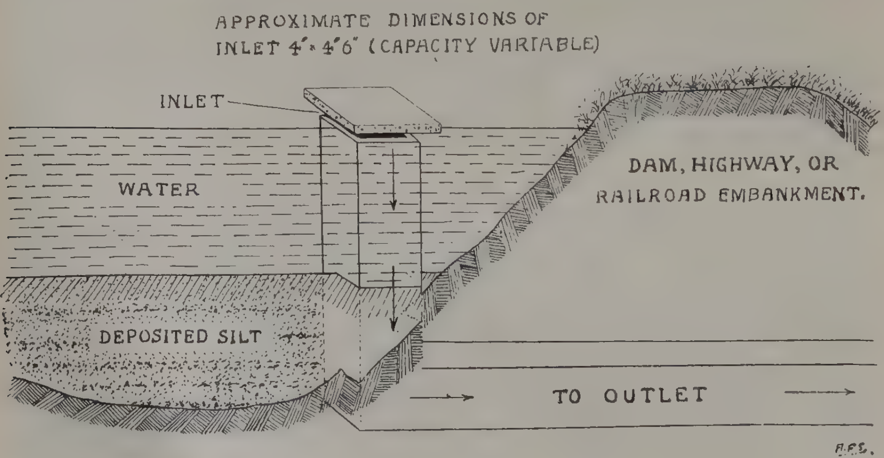


Plate 45.

CULVERTS AND DRAIN PIPES UNDER HIGHWAY AND RAILWAY EMBANKMENTS ARE FREQUENTLY THE CAUSE OF GULLYING OF LAND IMMEDIATELY BELOW THEIR OUTLETS. VERTICAL DROP INLETS PROVIDE FOR THE DEPOSITION OF SILT BY THE SLOW RELEASE OF WATER FROM THE SURFACE.

An effective scheme for an entire farm holding would probably necessitate a readjustment of the layout of cropping areas. Careful thought should be given to a planting programme which will not only allow for a reasonable margin of profit, but which also will assist in the conservation of the soil. This programme also will be influenced by such factors as land values, soil qualities, produce values, transport facilities, and labour costs.

A far-sighted policy is obviously necessary, and there is no reason to believe that any difficulties cannot be overcome in Queensland as they have been in many other countries.

Plate 46.

THIS ILLUSTRATION IS INTENDED TO DEPICT SOME OF THE COMMON PRACTICES AND EFFECTS OF PRESENT-DAY FARM MANAGEMENT WHICH LEAD TO THE LOSS OF SOIL AND ULTIMATE DESTRUCTION OF FIELDS BY EROSION.

(A) Straight row cultivation and square fields.

(B) Gully development in natural depressions.

(C) Waste corners cut off by gully.

(D) Steep headland drain of unknown grade—a gully of the future.

(E) Neglect to check development of gullies by obstructing the flow of water.

(F) Destruction of timber on banks of watercourse.

(G) Ploughing and cultivating in direction of slope.

(H) River flats—row crop cultivation.

(I) Watercourse

(J) Non-subdivision of pasture areas.

(K) Destruction of timber on slopes greater than 15 per cent.

(L) Shade trees.

Control.

As the eroding power of moving water is governed by volume and velocity, the principles of prevention must be based on the control of these factors. In simple phrase, it is necessary to make "running water walk." This may be accomplished practically and methodically by diverting the flow of water from its most direct course to a line around the contours of the hills until a suitable outlet—such as a permanent pasture, timber belt, or vegetated waterway—is reached.

A contour is a line on the earth's surface joining all points of equal height. When constructing so-called contour terraces and drains, it is usual to allow a slight fall (termed "the grade") to carry the water slowly away.

Plate 47.

THE SAME FARM (PLATE 46) AS IT WOULD APPEAR UNDER A SYSTEM OF MANAGEMENT PROVIDING FOR THE CONSERVATION OF SOIL AND THE RECLAMATION OF GULLIES.

(A) Contour channels—direction of grade ⟶.

(B) Gully too large to cross.

(C) Small gully crossed by contours.

(D) Vegetated waterway (channel outlets).

(E) Check dams in large gully (concrete, wire-netting and bramble, logs, straw, &c.)

(F) Timber protecting banks of watercourse.

(G) Strip-crop area—gentle slope not warranting contour drainage—cropping and cultivation on contour.

(H) River flat—row crop cultivation.

(I) Watercourse.

(J) Subdivided pasture areas for rotational grazing.

(K) Timber on slopes greater than 15 per cent.

(L) Shade trees.

(M) Contour furrows—pasture improvement.

(N) Hardy vegetation in large gully wherever possible—e.g., elephant grass or other suitable binding herbage.

(O) Channel outlets onto permanent pasture.

By preventing rapid run-off, more time is allowed for the penetration of water into the soil. In some cases, where the soil has a high infiltration value and where the rainfall is not excessive, run-off has been completely checked. The improved soil moisture content—the natural corollary—has the obvious result of stimulating the growth of both crops and pastures.

For the improvement of pastures, a common and simple practice is to open up single or double contour furrows at regular intervals along the slope. The work is best performed with a reversible mouldboard plough, as it is necessary to turn the furrows uphill.

For the prevention of erosion on cultivated areas, a carefully designed system of broad-based contour terraces, as described later, is recommended.

Plate 48.

Erosion has already made its Mark on many Farms on the Darling Downs. Such Terraces as these guard the Fields during Fallowing Periods.—This picture was taken at Willowburn, and represents portion of a demonstration area terraced in 1935.

There are, however, certain necessary preliminaries in the reduction of soil losses, which may be done on any farm at little or no cost.

The following suggestions are offered:—

1. Plough and cultivate across the slope, preferably on the contour.
2. Grow seasonal cover crops—such as cowpeas, field peas, vetches, clovers, oats, rye grass, and Sudan grass. They may be utilised either for grazing or green manuring.

   A common practice is to sow late summer and winter growing cover crops at the time of the last cultivation of seasonal row crops. Cover crops have been aptly described as "a rug for rain-worn soils."
3. Establish vegetated head drains to arrest any sudden rush of water from the catchment area above the cultivation.
4. Foster and protect the growth of vegetation in existing depressions to prevent them from extending. It is an obvious advantage to grow, wherever possible, something useful, such as suitable varieties of cow cane, sacchaline sorghums, or other strong-rooting crops. The growth of narrow strips of bamboos or banana plants on boundaries or headlands will serve, in fruit districts, as windbreaks, while the roots will help to bind the soil. Such trees as the kurrajong, bottle tree, carob bean, or Portuguese elm may be grown successfully on the Darling Downs.

5. Practise crop rotation, remembering that more soil is lost from row crops than from close covering crops—such as lucerne, cereals, or even pumpkins.

6. Check the development of existing gullies by obstructing the course of the water with rubbish, logs, wire-netting and bramble dams, or anything else to lessen the washaway.

7. Provide for the reduction of the velocity of water in any necessary headland drains by placing in them such obstructions as mentioned in the preceding paragraph. Make the grade of drains as gentle as practicable.

8. Obtain the correct tilth when ploughing or cultivating. A cloddy tilth arrests more free surface water than a fine tilth and is less likely to "wash." Do not break the surface down until the final working before sowing. Deep cultivation increases the absorption of water by the soil.

9. Retain belts of timber on the banks of watercourses and on the tops or slopes of hills where the grade exceeds 15 per cent.

10. When ploughing slopes, throw the soil uphill. A reversible hillside plough is suggested.

11. Grow erosion-resisting strip crops at intervals across the slopes—e.g., Rhodes grass, lucerne, or cane. For the protection of clean-tilled seasonal crops, strips of such annuals as small grains, winter legumes, and forage crops are suggested for the winter; and sorghum, Sudan grass, or cowpeas for the summer.

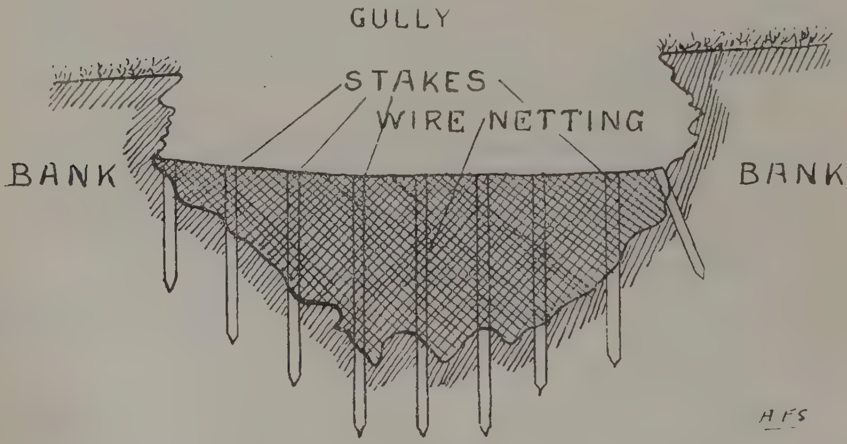


Plate 49.
WIRE-NETTING DAM WITH PACKED BRAMBLE, STRAW, OR OTHER MATERIALS.

On slight slopes in districts of low rainfall these precautions may, without doing anything else, be sufficient to reduce erosion losses to within reasonable limits. However, in steeply undulating country of high rainfall, like most of the coastal lands, they may be regarded as temporary checks only. Attention is directed, therefore, to the construction of broad-based contour terraces, which, in combination with strip crops, give the only guaranteed assurance of adequate protection against erosion. Their use may have slight disadvantages, but the fact

that thousands of farmers in countries practising the control of soil erosion continue to terrace additional fields annually is proof that the advantages of terracing must considerably outweigh the disadvantages.

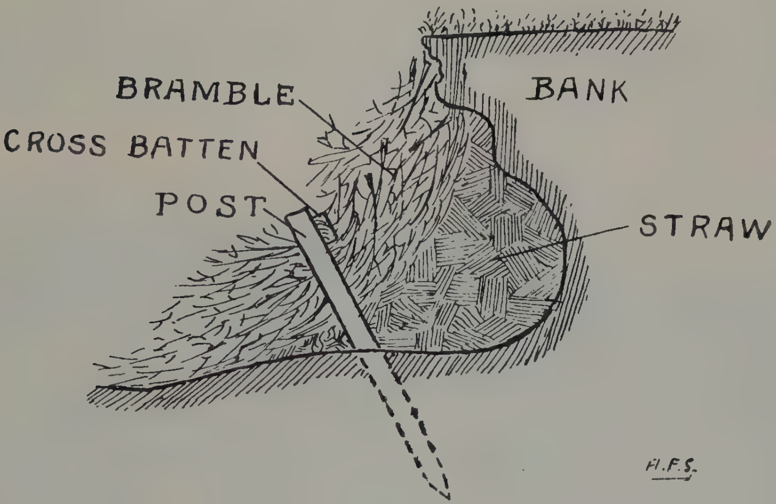


Plate 50.

METHOD OF CONTROLLING THE UNDERMINING ACTION OF EROSION AT THE HEAD OF A GULLY.

The system has been very extensively tested in America particularly, where it has been found efficacious under actual and varied farm conditions.

Plate 51.

PROPERLY CONSTRUCTED CONTOUR TERRACES PREVENT "WASHING" BY MAKING "RUNNING WATER WALK." (*Photo. taken at Willowburn, Darling Downs,* 1935.)

Construction of Terraces.

Care must be taken in the construction of these low, broad, undulating banks to ensure that they are capable in an emergency of arresting the maximum amount of rainwater likely to be precipitated in any one fall.

The use of some accurate levelling device, such as a dumpy level or home-made wooden level, is necessary in defining the proposed lines. Terraces form intercepting channels, at carefully calculated intervals, which arrest the flow of water down the slope and thereby provide low-velocity surface drainage.

Plate 52.

LOW, BROAD TERRACES DO NOT HINDER THE NORMAL OPERATION OF CULTURAL IMPLEMENTS. (*Photo. taken at Willowburn, Darling Downs*, 1935.)

The three main requirements of a terrace cross-section are—

1. Ample channel capacity.
2. Channel and ridge slopes flat enough to permit the operation of implements along the terrace without unduly breaking down the terrace or hindering tillage operations.
3. Economical cost of construction.

In planning a system, it is of the utmost importance to locate the first terrace near enough to the drainage divide to intercept the run-off from the contributing area before it gains erosive velocity or a volume which will exceed the capacity of the first terrace channel. A point to be remembered is that the velocity increases not only with the degree of the slope, but also with the length of the slope.

In designing any contour drainage system, it is advisable to first prepare a plan of the area, marking suitable outlets for the disposal of the channel water, the slope of the fields, existing gullies and other obstructions, and the approximate length of the proposed terraces. This plan should serve in determining the distance between terraces, their grade (whether uniform or variable), and length of grade in any one direction.

A variable grade is necessary for terraces greater than 15 chains in length and having only one outlet. The grade becomes progressively greater as the terraces approach their outlets. For the first few chains, it is usual to allow only a very slight grade, if any.

Terraces longer than 15 chains, however, should have a double outlet wherever possible. This is accomplished by reversing the reading at a suitable point (preferably in the centre of a depression or on top of a ridge) when surveying and pegging out the proposed line.

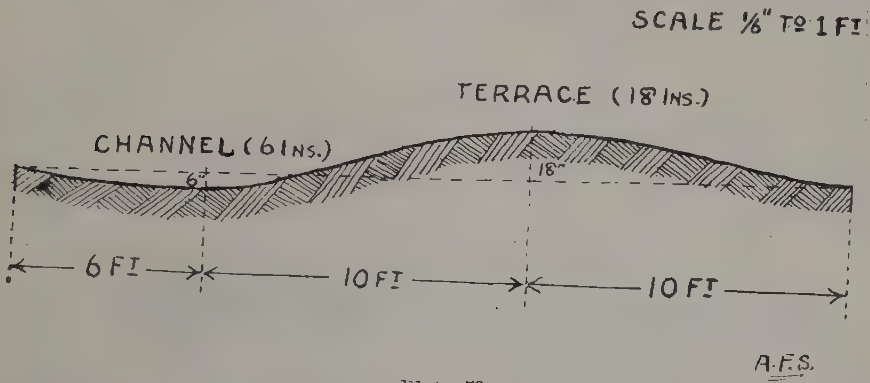


Plate 53.
Cross-section of Consolidated Terrace, showing Dimensions to be maintained.

The lines are best located by the use of a dumpy level; for small areas, a simple home-made level of wood can be used successfully. This level may be described as a light wooden frame with a span of 16 feet 8 inches at ground level; thus six spans will equal 100 feet. The frame itself consists of two sloping legs, each 8 feet long, a top cross-member also 8 feet long, and a central cross-member 12 feet 6 inches long. The lastmentioned crosspiece must be exactly parallel with the base line; the success of the level depends on this point. To obtain the required terrace grade, a proportionate length is cut off one leg; for example, to obtain a fall of 6 inches in 100 feet it would be necessary to cut 1 inch from leg, half an inch for a 3-inch fall, and so on. In pegging out a line, a carpenter's level is fixed to the central cross-member and the short leg is moved up or down the slope until a level reading is obtained. The long leg is always kept down the slope when commencing a terrace line from its outlet end. As the frame is moved forward, the rear leg is placed on the last position of the front leg. A peg is inserted at each point when located. A plumb-bob may be used instead of the level by attaching it to the exact centre of the top crosspiece and making a fine, distinct mark at the centre point of the centre cross-member.

If the level is to be used for different grades, an adjustable foot may be made on one leg.

When locating points with a dumpy level, the surveying staff is simply moved up or down the slope until the desired reading is obtained. A number of readings may be obtained in both directions from the one position of the tripod and level. It is usual to take readings at chain intervals on regular slopes. However, when crossing depressions or rounding ridges, readings at ½-chain intervals or less are necessary.

The correct allowance for grade is calculated in this way:—As all grades are given in a fall per 100 feet, this figure must be reduced proportionately to a fall in 66 feet. As the staff is graduated in feet

and decimals thereof, the determined number of inches must be reduced to a decimal point of a foot; for example, a fall of 4 inches in 100 feet equals 2·64 inches in 66 feet or ·22 feet in a chain. When commencing readings from the outlet end, this allowance is subtracted from the total reading at the end of each chain to obtain a fall, and *vice versa.*

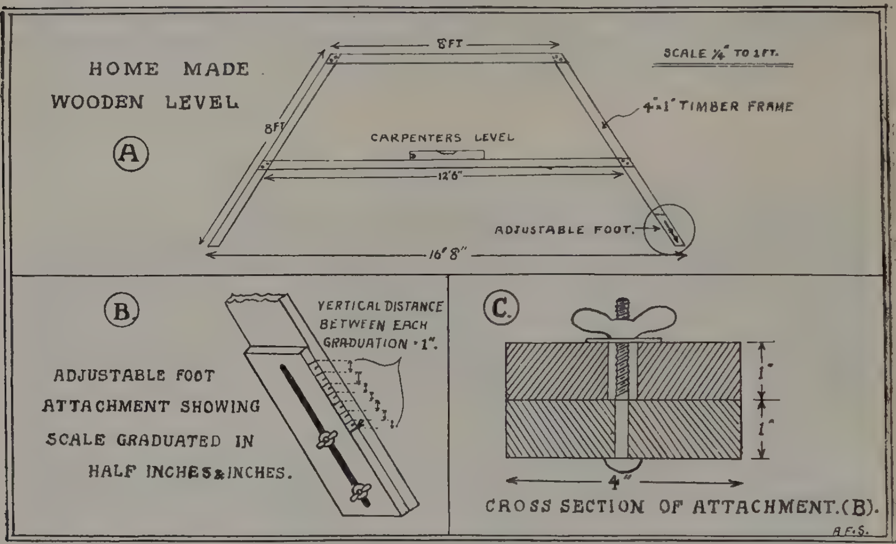


Plate 54.

THIS WOODEN LEVEL IS OF SIMPLE CONSTRUCTION AND MAY BE USED SUCCESSFULLY FOR PEGGING CONTOUR LINES ON SMALL AREAS.

It is usual to modify the acute curve when crossing gullies, and fill in the gully immediately above and below the terrace. At such points it is necessary to raise and strengthen the terrace banks.

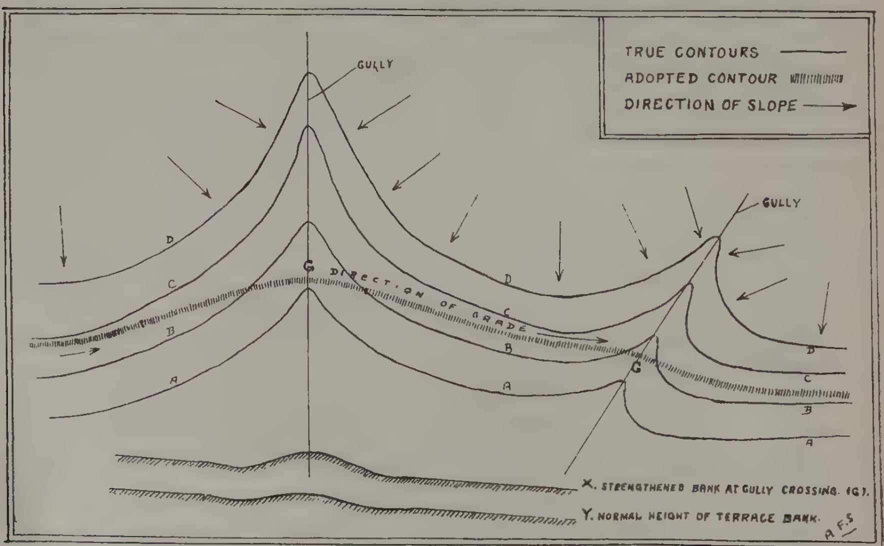


Plate 55.

WHERE CONTOUR TERRACES INTERSECT GULLIES, IT IS NECESSARY TO MODIFY THE ANGLE OF THE TRUE CONTOUR LINE AND RAISE AND STRENGTHEN BANKS AT SUCH POINTS.

Gullies too large to fill in in this way are best used as a dividing point in the length of the terrace. Suitable grades are allowed to carry the water away from, and not into, the gully. Additional measures for the reclamation of gullies, as previously described, should also be adopted.

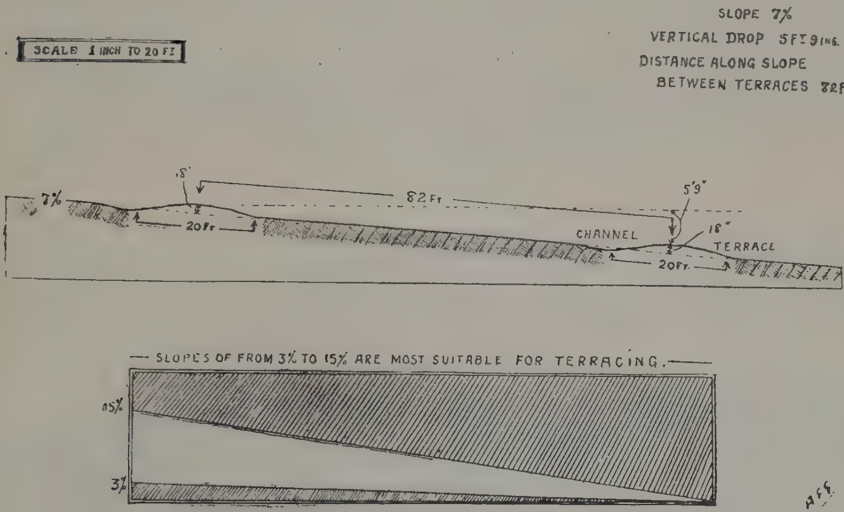


Plate 56.

The Distance along the Slope between Terraces is Governed by the Slope of the Land.—Such distances are calculated from the maximum permissible vertical drop as indicated in the accompanying table.

TABLE 1.

Inches of Fall in each 100 feet of Variable Graded Terraces.

(From Farmers' Bulletin 997, U.S. Department of Agriculture).

Section of Terrace.	Slope of Land.		
	5 feet in 100.	10 feet in 100.	15 feet in 100.
Feet.	Inches.	Inches.	Inches.
0 to 300	½	¾	1
300 to 600	1	1½	2
600 to 900	2	3	4
900 to 1,200	4	6	7*

* A terrace 1,100 feet long should have a fall of 6 inches in 100 feet at the lower end where the land has a fall of 15 feet in 100 feet.

TABLE 2.

Distance between Terraces on Different Slopes.

Slope in feet per 100 feet.	Vertical Drop between Terraces.	Distance between the Terraces along the Slope.
	Ft. in.	Ft.
1	1 9	150
2	2 6	125
3	3 0	100
4	3 6	87½
5	4 3	86
6	5 0	83
7	5 9	82
8	6 3	78
10	6 6	65
12	7 0	58

Terrace intervals are governed by the slope of the ground. They are spaced according to a calculated vertical drop between them, as shown in the accompanying table. In arriving at such calculations, the catchment area and slope are considered and the terraces are placed sufficiently close to one another to check the flow of water before it gains erosive velocity.

It is always necessary to construct the highest terrace first, as otherwise the catchment area would be proportionately too great for the channel capacity of terraces lower down the slope should heavy rain interrupt constructional operations.

Plate 57.

BROAD-BASED TERRACES MAY BE CROSSED WITH SEED DRILLS WITHOUT INJURY.—This field at Willowburn, Darling Downs, was sown with wheat during the settling of the newly-constructed terraces.

For the terracing of large areas, mechanical graders are the quickest and probably the most economical. Various types of home-made graders have also been used successfully. However, for a beginning, the banks may be simply and satisfactorily built with a multi-disc plough and harrows. Chain harrows are excellent, as they conform to the curves of the terrace. To commence the construction of a terrace bank, first plough along the lower side of the line of pegs, throwing the soil uphill. The return trip is made on the upper side of the centre line, and thus a crown is formed. Ploughing is continued until a strip of from 16 to 20 feet in width on average slopes has been completed. Usually it will be found that the wider the terrace the better. Again, commencing in the centre of the strip, the ploughed ground is further worked up into a crown, but this time the number of rounds of ploughing is reduced by one to give a gently rising shoulder to the finished bank. This procedure is continued until a broad-based mound is formed having a central height of at least 18 inches above the original ground level. An allowance of 3 or 4 inches should be made for settling. The bank may then be smoothed down by harrowing.

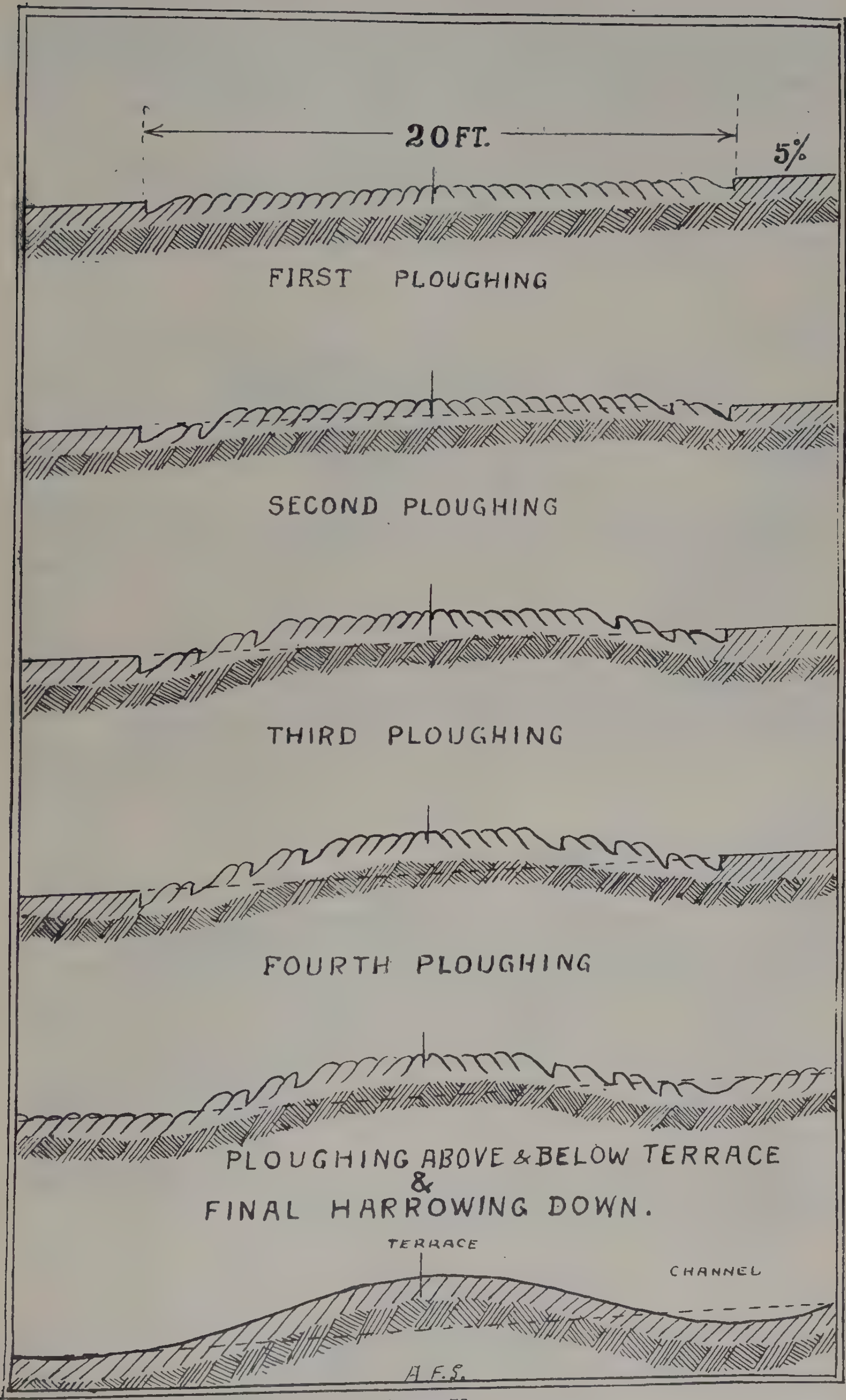


Plate 58.

METHOD OF CONSTRUCTING CONTOUR BANKS WITH A DISC PLOUGH AND CHAIN HARROWS. A V DRAG IS OF CONSIDERABLE ASSISTANCE.

A V drag has been used successfully for widening terrace channels. The long side of the implement exerts pressure against the land side of the last furrow above the terrace, while the short wing of the drag forces the loose ploughed soil further up on to the bank, thus widening the bottom of the shallow terrace channel.

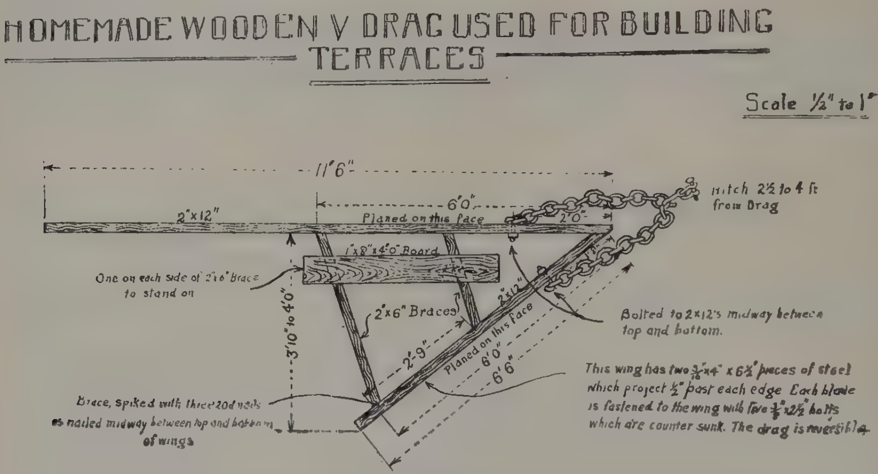


Plate 59.

A [illegible] strip is of considerable value in protecting the soil during the settling and consolidating of the banks.

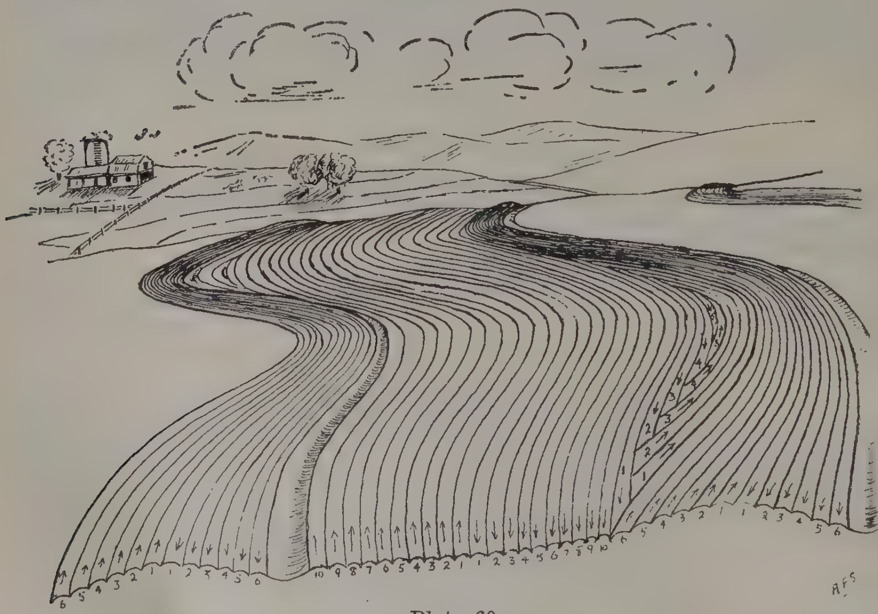


Plate 60.
METHOD OF PLOUGHING TERRACE INTERVALS OF IRREGULAR WIDTH.

Maintenance of Terraces.

Once established, the only maintenance necessary is a little extra time and trouble in ploughing and an occasional clean-out of the terrace channels. The frequency of this work will depend on the care taken

when ploughing, but it is important that it should not be neglected. It is always advisable to plough the terraces first. In so doing, a central crown or back furrow is made on top of the terraces and the furrows on both sides are turned towards the centre until the whole terrace has been ploughed. The terrace intervals are then ploughed separately, the number of lands depending on the width of the interval. It will often be found possible on grades of 10 per cent. or more to plough this strip out in a single land. In some places it may be found preferable to plough around the terraces, making the final dead furrow midway between terraces. Care should be taken, however, when turning furrows

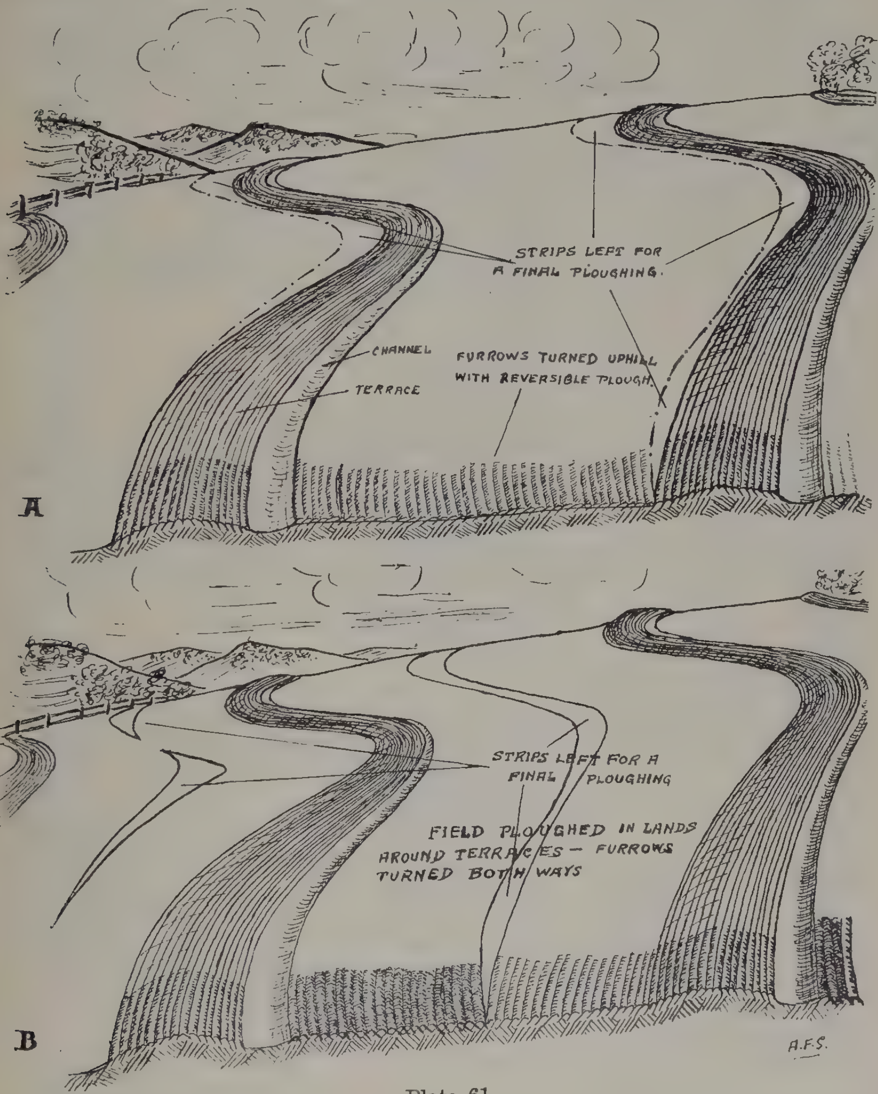


Plate 61.

The Position of the Irregular "Island" Strips of Land left for a Final Ploughing should be changed with each Successive Ploughing of the Field. This Illustration depicts One of Several Methods.

A. First ploughing. B. Second ploughing.

down the slope, not to fill in the terrace channel. As terraces are seldom, if ever, parallel, small "islands" will be left at the points of greatest width along the last furrow. It is obviously necessary to plough these individually.

For the second ploughing of the terrace intervals, a back furrow should be made on the site of the previous dead furrow. By alternating the ploughings in this way, the development of deep depressions will be avoided and the thorough working of the entire field will be accomplished.

A two-way plough may be used to advantage for the ploughing of terraced fields, as both back furrows and dead furrows in undesirable locations may be eliminated without special effort and all furrows between terraces may be turned up the slope.

Strip-cropping in Combination with Terracing.

These two systems of prevention—strip-cropping and terracing—constitute an invaluable combination. Naturally, the class and productivity of the soil govern largely the strip crops to be grown, but do not influence their location. By varying the width of the strip crop on and below the terrace, the remaining area for row-crop cultivation may be

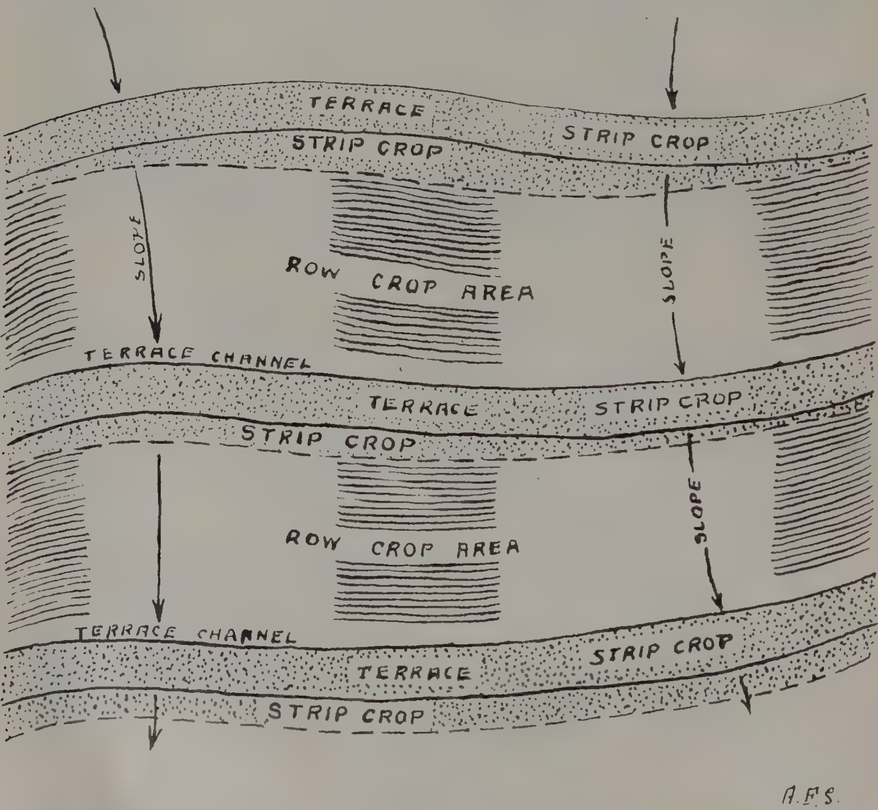


Plate 62.

METHOD OF STRIP-CROPPING EVERY TERRACE.—The width of the strip is varied to take up the short row area. This practice safeguards the terrace during its settling.

reduced to a parallel strip, thus overcoming the difficulty of short rows. When this system is adopted, it is usual to strip-crop every second terrace only, the alternate terraces being included in the row-crop area. All cultivation, of course, is on the contour.

In a rotation plan the location of strip crops may be altered to a position midway between terraces. The terraces may then be devoted to row crops.

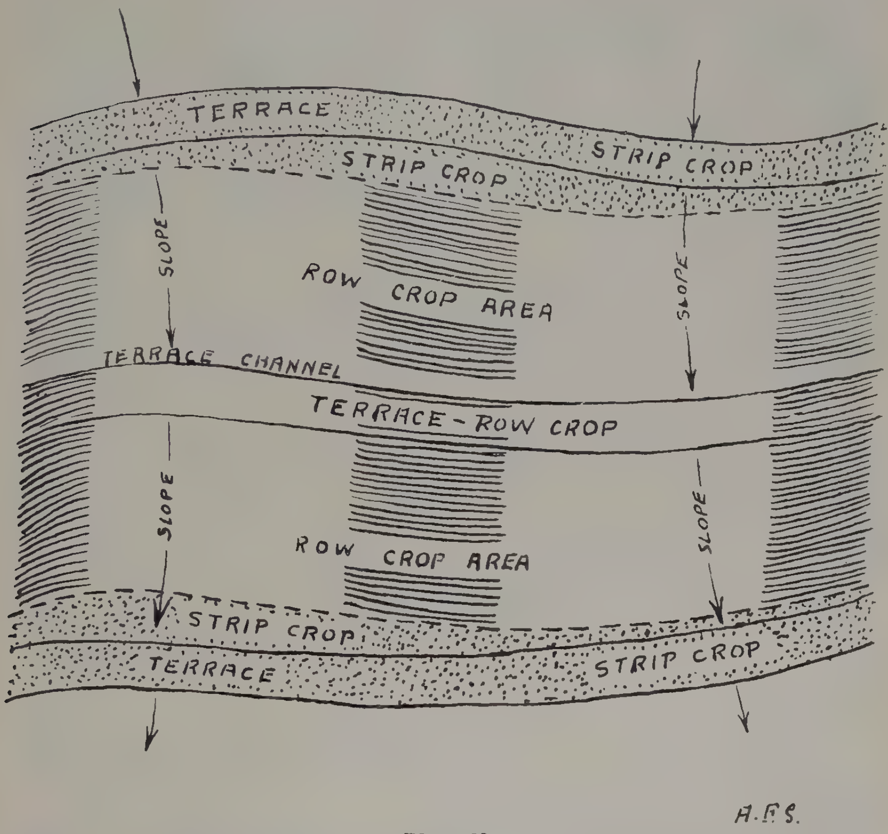


Plate 63.
Method of Varying the Width of Strip Crops on Alternate Terraces to take up the Short Row Area.

Again, the strip-crop area may be varied in width to fill up the short row area. The simplest method of achieving this is to plant the row crop first, leaving sufficient width for the strip crop. This may then be sown broadcast to fill up any irregularities in the width of the strip.

Conclusion.

To completely combat erosion in any country is far too great an undertaking to accomplish in a few years, but it is rather the cumulative effort of several generations.

Similarly, the subject has so many varied and complicated aspects that it has been possible only in these notes to deal briefly with the most important points in respect of erosion of farm lands. However, if this discussion helps to increase the interest of Queensland farmers in the growing menace, good results are certain to accrue.

Objections may be raised at first to the slightly increased difficulty of farming contoured fields, but once it is fully realised that any slight disadvantages are greatly exceeded by the advantages of a soil-saving plan of farm management, there is little doubt that the proposed schemes will meet with ready acceptance.

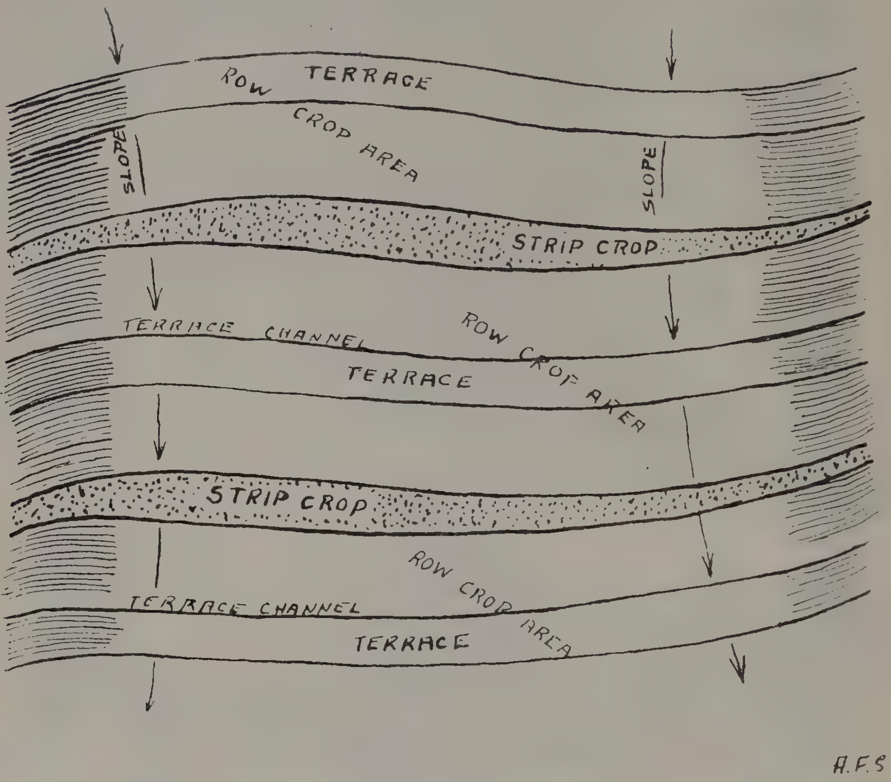


Plate 64.

THE STRIP CROP MAY BE CHANGED TO ANY POSITION ON OR BETWEEN TERRACES TO PROVIDE FOR ROTATIONAL CROPPING. IT IS CONSIDERED ADVISABLE, HOWEVER, TO KEEP OPEN THE TERRACE CHANNEL.

With abundant and often tragic proof of the rapid deterioration of farm land, following on the pursuit of traditional farming practices, the United States of America has adopted a policy of active intervention by establishing a special soil-conservation service. As a result of extensive exploratory work, efficient and acceptable control measures have now been convincingly demonstrated, and a great wealth of information applicable to our own requirements may be gleaned therefrom. The basic principles of control must, obviously, remain unchanged, but it is anticipated that certain modifications and perhaps extensions of the American methods may be necessary.

In the light of available information, and with a practical knowledge of Queensland requirements, the recommendations contained in these notes are offered with confidence.

The Department of Agriculture and Stock is anxious to foster and assist practically in the promotion of soil-saving programmes, and will welcome, therefore, the inquiries of interested readers of this Journal.

Pineapples for Canning.

JAS. H. GREGORY, Instructor in Fruit Packing.

MUCH has been said and written in recent years about the respective responsibilities of growers and canners in the handling and processing of pineapples. With operations involving primary and secondary enterprise in a common output, the necessity of complete co-operation is apparent if economic efficiency is to be attained.

The pineapple industry is affected as much as any other Australian primary enterprise through the competition it has to meet on export markets.

This fact has been often obscured by argument between growers and canners as to the advantage, or otherwise, of sending fruit to the cannery with "tops on" or "tops off." The argument has now been settled, apparently, by a common agreement that "tops off" is, economically, the most satisfactory method of factory supply.

To the grower, however, removing the tops may seem to be the end of his responsibility in preparing fruit for the factory. When it is considered, however, that restriction of space and high rates and rents in city areas add to factory costs, some operations could be done more economically on the farm; and as all growers are shareholders in a cannery, the reduction of factory costs has become obviously a direct personal interest. Properly prepared fruit can be handled at the cannery without loss of time. Minor work—such as sizing, grading, trimming, and colour selection—if done properly in the packing shed, facilitates the work at the cannery.

Good packing, by getting full weight of fruit in the case, also is a factor in keeping down expenses, as it costs as much to handle partly filled as full cases. If the average weight of a case is increased by a few pounds, the daily gain to the industry will be considerable. Care in cutting down these costs should help to increase returns to growers when costs and prices are assessed.

Factory Operations.

A short explanation of the actual operations at the cannery when the fruit is received should assist growers in understanding the necessity for giving their wholehearted co-operation. To obtain even a better idea, growers are advised to visit a cannery when in full operation.

On arrival at the factory siding, cased fruit is removed from the truck and placed on a gravity roller conveyor leading into the factory. As the case passes along, it goes over a weighing machine. The name

of the grower and gross weight and tare of the case are taken and listed. The fruit is fed on to one of several Ginaca machines, each of which has a capacity for handling forty-five pineapples a minute. The machine peels and cuts the fruit to the diameter to fit the can, removes the ends, takes out the core, and delivers the fruit to the trimming table. The same machine also removes the surplus flesh from the skin and transports it to an inspection table. The skins, ends, and cores are treated for use as cattle food.

During all these operations a constant speed is maintained by the machine, its output being governed by the quantity of fruit placed to fill each section of the feeding elevator. Any hold-up of supplies through bad sizing and grading means waste time, which the machine cannot make up. Two men feed the elevator, and one inspects the fruit half-way along the elevator. These three men size and grade the fruit to prevent mechanical trouble developing during operations. The machine feeds to the trimming tables on conveyors, which ultimately carry the fruit to the slicing knives and canning section.

The staff required on the trimming section varies according to the quality and type of fruit. With first-quality fruit, seven trimmers can handle a machine at full capacity. Fair average fruit requires nine trimmers; with poor, ill-shaped fruit, it is necessary to have eleven trimmers to avoid having to stop the machine to clear the trimming section. It can readily be understood that fruit as illustrated in Plates Nos. 66, 67, 68, and 69 requires more trimming than the good type shown in Plate No. 65. The machine keeps up the same steady delivery of fruit to the trimmers, and if extra time is taken to trim ill-shapen fruit, causing congestion, the machine must cease to be fed for a period. This means loss of time and increased overhead costs.

As cannery output is governed by the quantity of fruit handled, the failure of machines to deliver their maximum output may be a big factor in increasing overhead costs. If one section of the cannery does not work to capacity, it prevents the other sections from doing likewise. The co-operation of the grower with factory staffs is necessary, therefore, to achieve the maximum results.

Type of Fruit Required.

To assist growers, a series of photographs have been taken of fruit extracted from actual consignments received at the factory. The explanation of these should show growers what not to do when packing. Also, a series of drawings is presented showing the actual recovery of fruit from good types of each size. A study of these drawings will enable growers to appreciate the necessity for careful sizing.

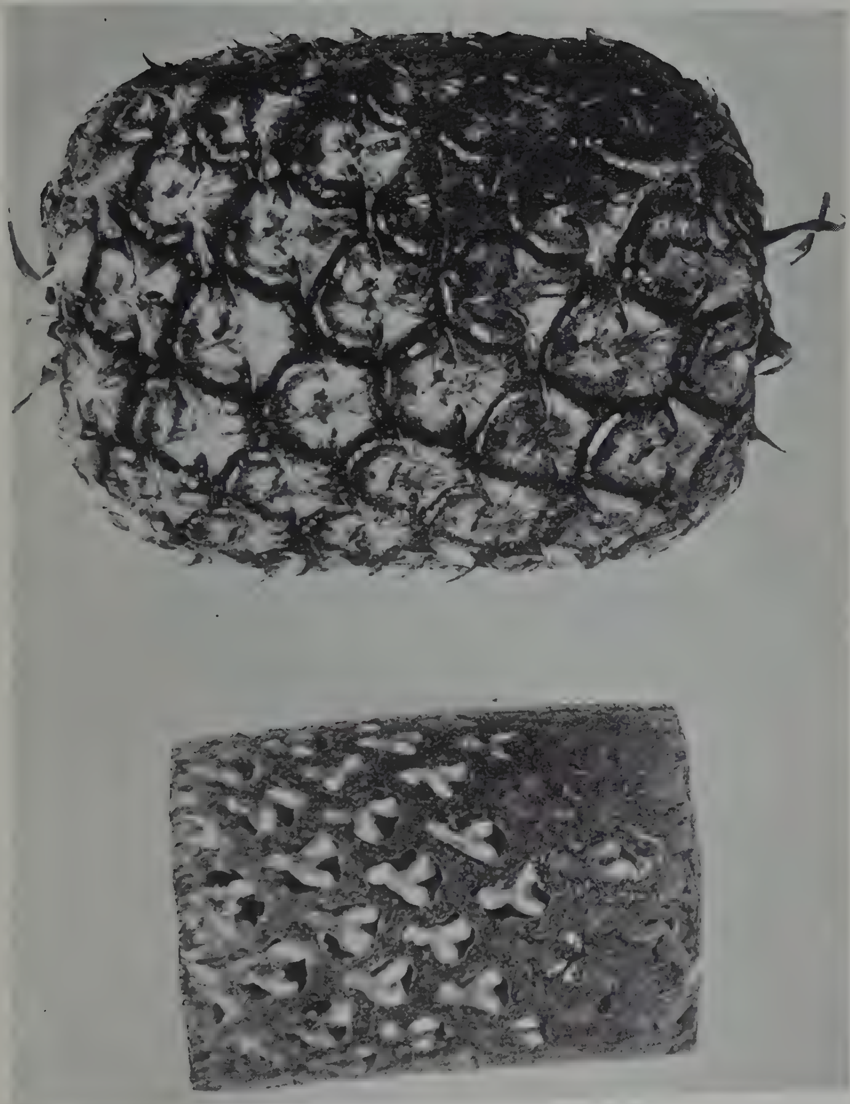


Plate 65.

Pineapple Suitable for Canning Purposes.—Showing square shoulders on fruit and minimum amount of trimming required after removal of the core and skin.

The type of pineapple shown in Plate 65 is that which is most suitable for canning purposes—being long, square-shouldered at top and base. Such fruit requires a minimum of trimming and time spent on it to place it as first quality for canning.

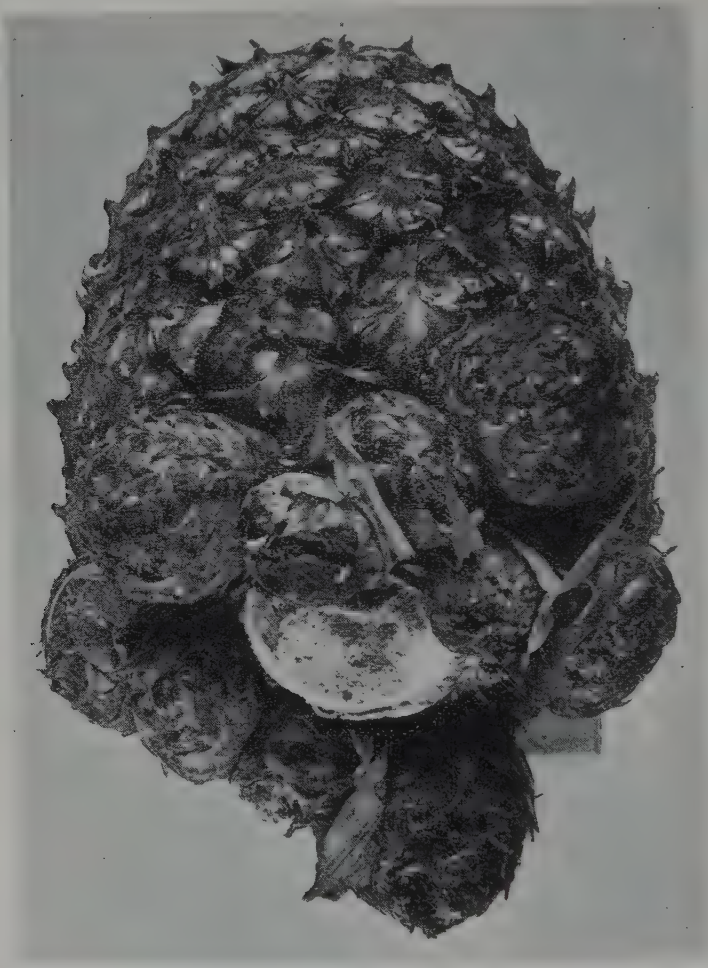


Plate 66.

TYPE COMMONLY PACKED FOR FACTORY.—Showing superfluous growth on base of fruit, which should be trimmed off.

The fruit illustrated in Plate 66 is a common type on plantations. The small adventitious pineknobs should be cut off before despatch to the factory. Feeding fruit of this type into the machine would bring about a variety of complications.

The type of fruit shown in Plate 67 is unsuitable because, its length being almost the same as its depth, it, more often than not, turns over when being fed into the peeling section of the Ginaca machine. This

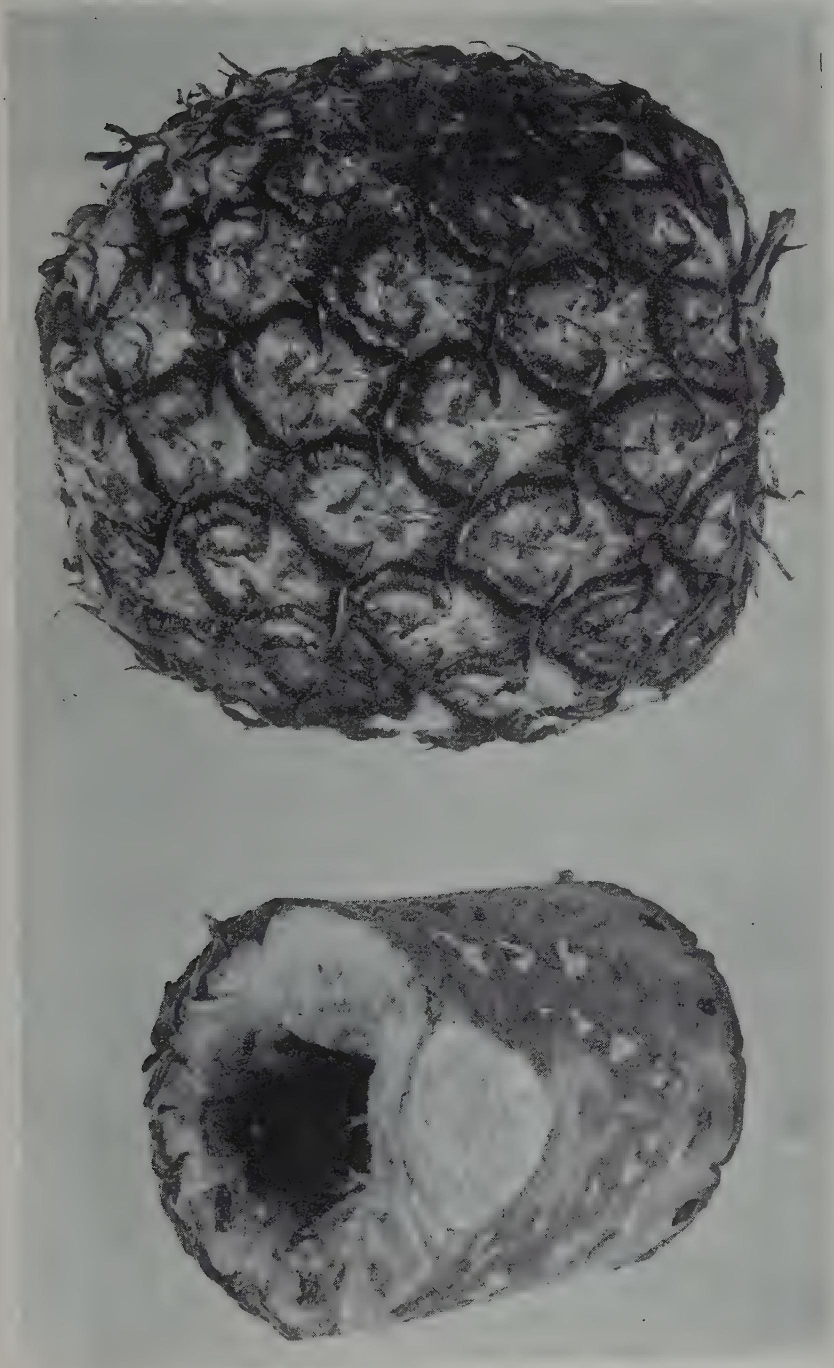


Plate 67.

Short or Round Type Fruit.—Unsuitable because of its tendency to turn over and so escape coring. Note how the core is left in the fruit, the fleshy part actually being removed instead.

causes the core-removing machine to punch a hole through the flesh, from side to side across the fruit, leaving practically all the core to be removed by hand. What is left of the fruit after the removal of the core residue is unfit for the slicing machine to turn into first or second quality canned fruit.

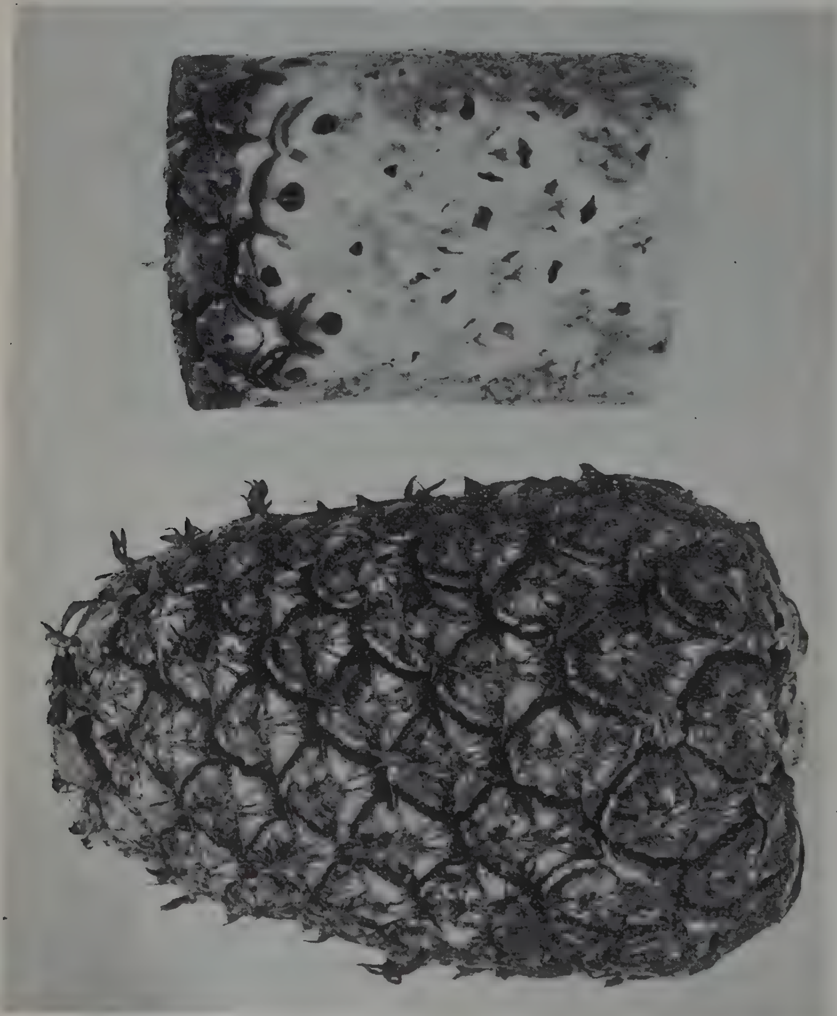


Plate 68.

A TAPERED TYPE OF PINEAPPLE.—At least half of this type of fruit has to be trimmed off to remove the "eyes."

Plate 68 shows a tapered type of pine and the centre obtained after it has been through the machine. It will be noted that it is necessary to trim from the pineapple nearly half its length to remove the eyes missed by the machine at the tapered end. This leaves little of the fruit for first-grade canning. Growers, when packing, should place this type of fruit in the next smallest size, as advised in the notes on sizing. It can be readily understood that extra treatment is required and the time expended in handling is increased, but the value of the fruit

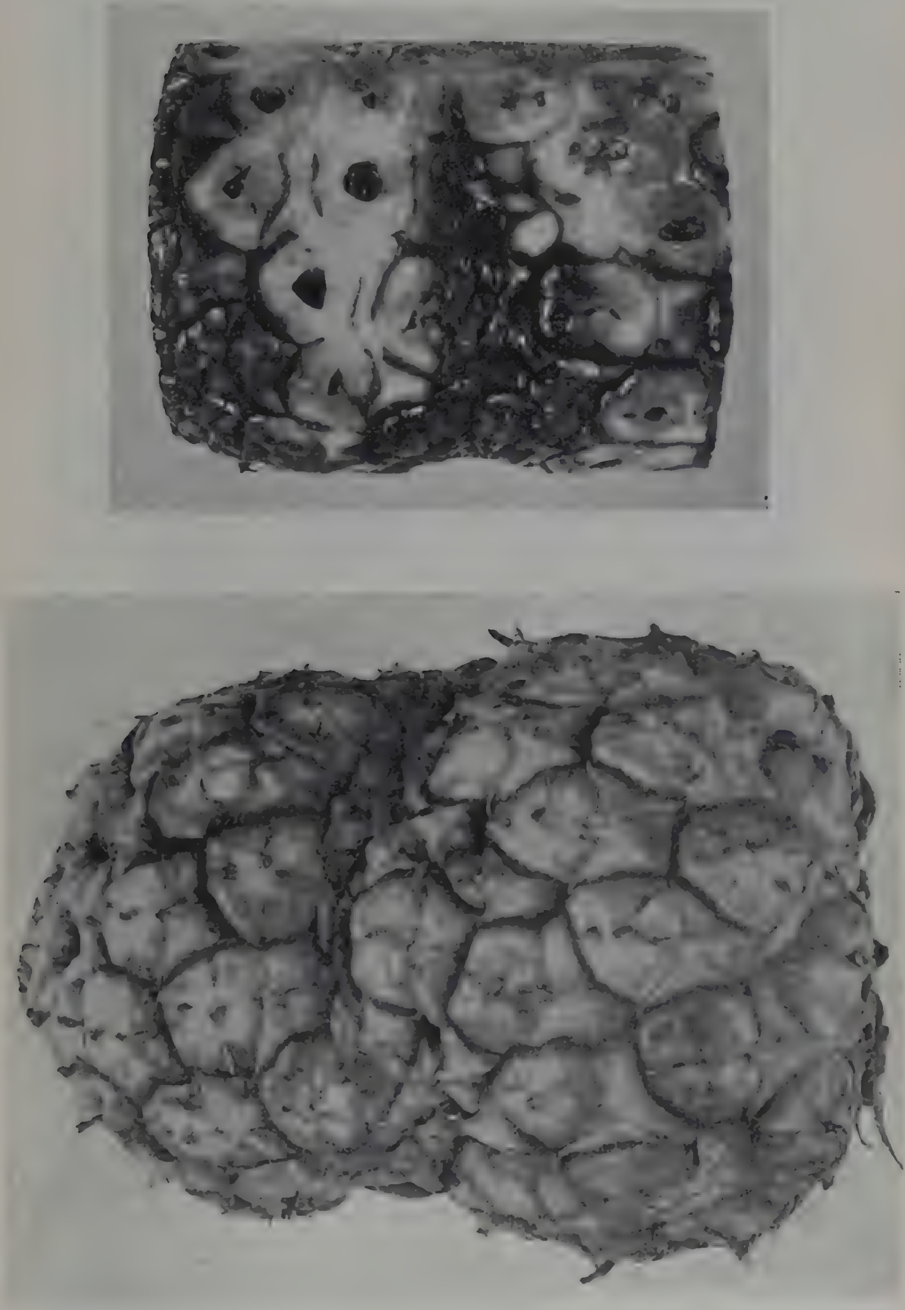
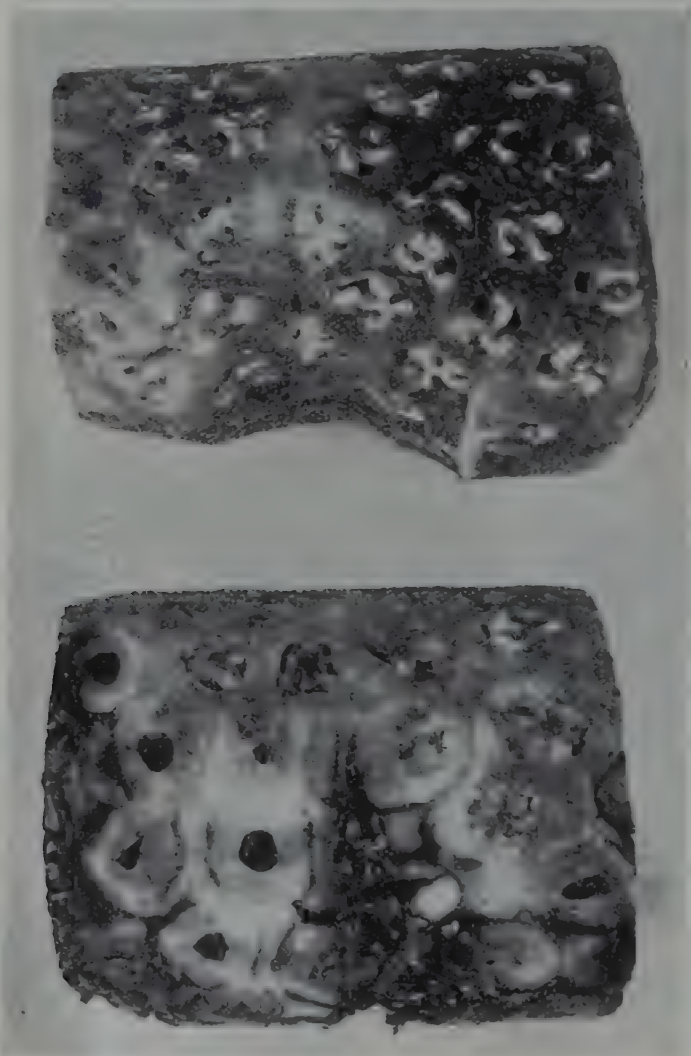


Plate 69.

Badly Shaped, Crippled Pineapple Before and After Peeling Process.

recovered is not as great as that received for the type of fruit illustrated in Plate 65. The trimmed centre before feeding to the slicing machine appears to be very similar to that illustrated in Plate 70.

This type of fruit (Plate 69) is exceptionally hard to handle, and is undesirable for factory use. Growers, if they feel that they must send fruit of this type, are advised to pack it apart from good-shaped fruit. The factory has to definitely rule poor-type fruit out; so growers send it at their own risk.



A. B.

Plate 70.

CENTRES CUT FROM FRUIT ILLUSTRATED IN PLATE 69.—Showing (A) before trimming, and (B) after trimming. How many first-grade slices could be obtained from fruit of this type?

As can be seen, after peeling and trimming, nothing fit for feeding to the slicing machines is left, and all the labour, time, and other expense involved means practically nothing over for the grower. Remember, more time and handling is involved with badly shaped than with correctly shaped fruit!

The difficulties of processing fruit like this are apparent, for only about half of the recovery is suitable for canning. The overhead expense involved is the same as that for fruit of good type. The cost of handling is increased 100 per cent., while the return of fruit is only 50 per cent.

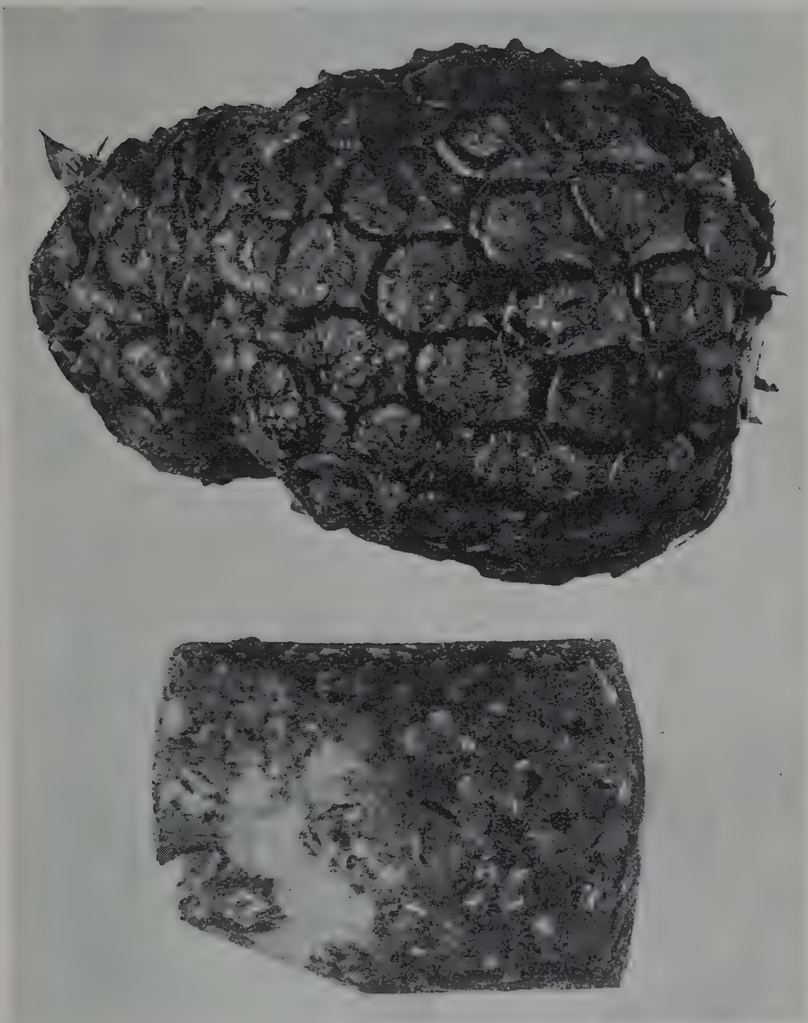
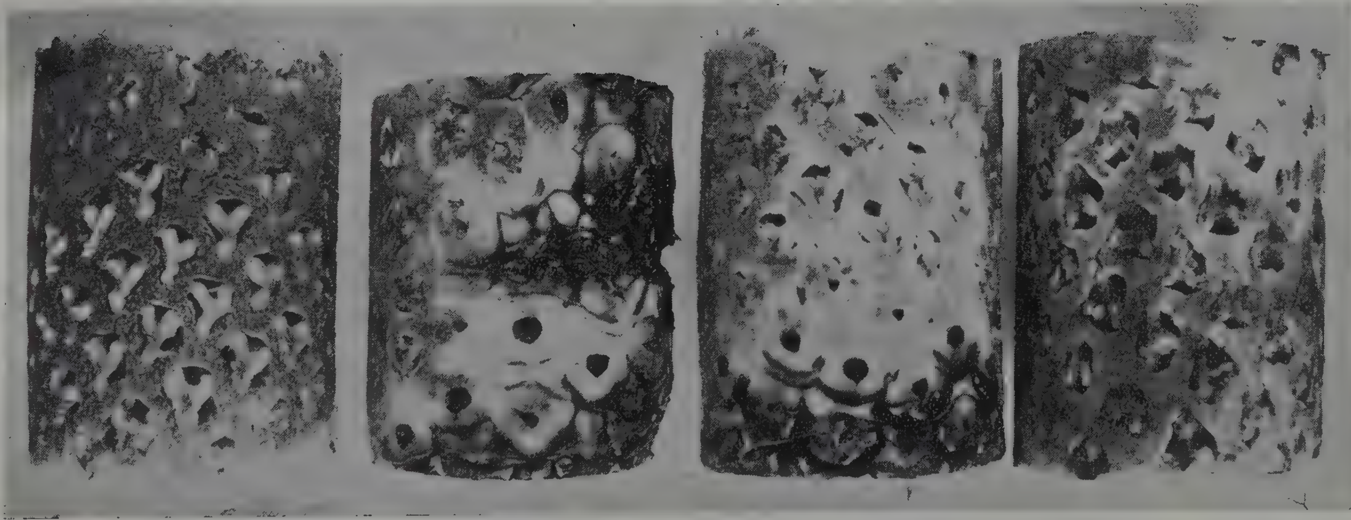


Plate 71.

ANOTHER TYPE OF CRIPPLED PINEAPPLE WITH A DEFINITE SECOND-GROWTH DEVELOPMENT.—Approximately only half is suitable for using as sliced pineapple.



A B C D

Plate 72.

CENTRES FROM VARIOUS TYPES OF FRUIT.—(A) Centre from good-type factory pineapple; (B) taken from pineapple with double growth; (C) bottle-shaped pineapple centre; (D) centre showing the effects of marbling—this cannot be canned under any circumstances.

Sizing the Fruit for Packing Factory Grades.

A study of the processable fruit obtained might give the impression that a larger centre could be taken from each fruit, but when the depth of the eyes is considered the actual difference between the outside ring measurement of diameter and the diameter of the flesh removed by the cutting knives is soon realised. The necessity for keeping the sizes above their minimum if the machines are to give a maximum recovery is plain.

Factory fruit is graded into four sizes—"Ones," "Twos," "Threes," and "Fours"—as follows:—

"Ones":—Fruit 4 inches in diameter and under 4½ inches.

"Twos":—Fruit 4½ inches to 4¾ inches in diameter.

"Threes":—Fruit over 4¾ inches in diameter but under 5⅛ inches.

"Fours":—Fruit 5⅛ inches and over in diameter.

No fruit less than 4½ inches in length from base of fruit to bottom of shoulder should be included. (*See* Plate 72 showing "Ones.")

Sizing rings suitable for measuring the pineapples are obtainable from the Committee of Direction of Fruit Marketing. The correct way of using the rings is shown in Plate 73.

Plate 73.

A Well-shaped Factory Pineapple.—Showing the method of using the sizing ring.

When measuring the fruit, the ring is placed over the top end. If the ring fits over more than quarter of the length of the pineapple (approximately $1\frac{1}{2}$ inches), the fruit should be placed in the next smallest grade (i.e., a fruit large enough to be a "Four" at the bottom would be classed as a "Three"). Plate 74 illustrates this point.

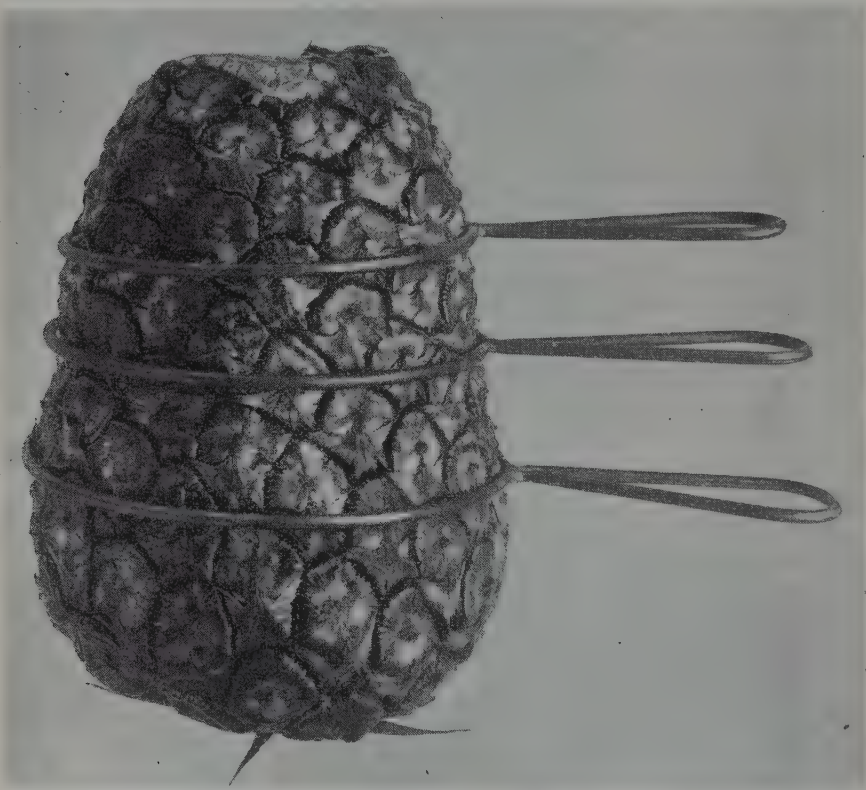


Plate 74.
SHOWING TAPERED PINEAPPLE WITH RINGS 2, 3, AND 4 GRADE PLACED ON THE FRUIT.

This pineapple (Plate 74) would be classed as a "Two," but is not a desirable type for factory use, for when marked down to a "Two" it has a tendency to be too big at the base for the "Two" machine to handle easily; but, if used as a "Three," it would have too many eyes left, entailing extra trimming.

Preparing the Case for Despatch.

Care in the marking of the cases correctly will save time and handling on and off the rail into the factory.

All cases should be weighed and the tare to the nearest pound stencilled on the top board on each side of the case. Growers should reweigh the cases regularly, for often cases are of green wood when first used, and gradually become lighter as they dry out. Neglect to do this results in loss to the grower, for the higher green timber weight would be deducted when assessing the weight of the fruit. Stencils for marking weights on

the cases are obtainable free of charge from the Committee of Direction of Fruit Marketing. Cases not branded for weight are usually tared at 15 lb.

The grower's name and district index mark should be branded on each side underneath the tare in letters at least 1 inch in height. The district marks are as follows:—

A Amamoor.
B Beerburrum.
C Cleveland.
D Dagun.
E Elimbah.
F Wamuran.
G Glasshouse Mountains.
H Manly.
J Nikenbah.
K Kandanga.
L Lagoon Pocket.
M Imbil.
N Nambour.
O Caboolture.
P Palmwoods.
S Gilldora.
U Eudlo.
W Woombye.
X Beerwah.
Y Gympie.

All size grades should be marked plainly on both ends of the case.

14
J. Jones, P.
Palmwoods.

Sides of case.

3

Ends of case.

After cases are returned from the factory, all markings should be erased where necessary, and the case repaired where damaged.

Packing.

Unfortunately, because of the variety of shapes and sizes of pineapples sent to the factory, standard packing systems, as used for most other fruits, cannot be conveniently applied. The aim of the grower, without sacrificing the grade, should be to place as high a weight of fruit in the case as possible. Most summer fruit handled in the tropical fruit case—24$\frac{3}{4}$ x 12 x 12—during packing experiments may be packed, using the following packing table:—

PACKS FOR FACTORY PINEAPPLES.
(Tropical fruit case 24$\frac{3}{4}$ x 12 x 12.)

—	Pack.	Count.	Layers.	Total.	—
"Ones" ..	2 — 1	6 × 5	2	34	Fruit placed directly one upon the other.
	2 — 1	5 × 5	2	30	Fruit placed in pockets. Large "ones" or small "twos."
"Twos" ..	2 — 1	5 × 4	2	27	Fruit placed in pockets. See note on 30 count.
"Threes" ..	2 — 1	4 × 4	2	24	Fruit placed in pockets. Large "twos."
	2 — 1	4 × 3	2	21	Fruit placed in pockets. Large "twos."
	2 — 1	3 × 3	2	18	Large "threes" or small "fours."
"Fours" ..	2 — 1	3 × 2	2	15	Fruit inclined.

NOTES.—Place shortest fruit in bottom layer.
Any long pineapples may be packed at the ends.
As far as possible, keep the top of the top layer level.
Crippled fruit should be excluded from all packs of good-type pineapples.

The method of placing the fruit is with the base of the fruit down in the bottom layer and reversed with the base of the fruit up in the top layer.

On some plantations, long fruit, more of the type as produced in the winter crop, are found. With large fruit of this type it was found best to pack the bottom layer base down as in the packs already mentioned, while the top layer was placed on this with the fruit resting on its side. When finished, all cases should have the fruit placed so that it comes level with the top and does not project above. This is necessary if fruit is to be canned without being damaged by the cases stacked upon it during transit.

No definite maturity standards are given, as this problem is still in process of investigation to enable a suitable guide to maturity to be fixed.

In conclusion, it is hoped that the information given in these notes will enable the grower to better understand some of the difficulties to be overcome in cannery operations. An understanding of these difficulties should help to foster closer co-operation between both sections of the industry, to the benefit of all concerned.

Acknowledgment.

Thanks are due to Messrs. J. Duthie and J. Howe, of the State Cannery, for much helpful comment and assistance, and to the growers who kindly assisted by supplying fruit for experimental purposes.

PINEAPPLE IN MEDICINE.

The following paragraph was sent by a teacher to the Editor of the *Queensland Education Office Gazette,* following upon an article in a previous issue of that journal:—

Some years ago, Senor Marcano, a leading medical authority of South America, discovered that the juice of the pineapple materially aids in the digesting of the proteids of both animal and vegetable foodstuffs. More recently, Dr. R. Chittenden, of the Connecticut Academy of Sciences, asserted that the fresh pineapple juice is a constant and powerful digestant of albuminous matters, acting in both alkaline and acid media, but more energetically in neutral than in either of the others. Chemists have now separated the active digestant principle and put it in the materia medica. This substance, closely analogous to pepsin, is known as bromelin. Pineapple juice has been found to be most efficacious in throat troubles and diphtheria, as the juice dissolves the fleshy tissue, such as is found in these ailments. A cure of diphtheria in a most marked and, in fact, abandoned case is reported in an American medical journal, as follows:—"For three or four years I have been hearing of the use of pineapple juice for the cure of diphtheria, but thought little of it. Recently, however, it has taken better shape in the report of a case where the child was given up by the doctor, and a friend, coming in, remarked that he had known children relieved by pineapple juice. The physician in attendance said, 'Get it and try it; it can do no harm.' A ripe pineapple was obtained and the juice expressed and given in teaspoonful doses slowly. It seemed to clear the throat, swallowing was much easier, and in a few hours the child was sleeping. Complete recovery ensued. A number of cases in the same neighbourhood were subsequently treated, with the same successful outcome." In bronchitis, also, pineapple juice has been found to be excellent, by Dr. Flasher of America, in softening the mucus. The pineapple is also a mild laxative. From the fruit itself, pharmaceutical chemists have separated a crystalline substance which they call mannitol, which is in active use in compounding prescribed medicines for throat and lung troubles.

The Queensland Nut.

J. M. WILLS, Fruit Branch.

THE Queensland Nut (*Macadamia ternifolia*), one of the best of the edible nuts, is indigenous to the coastal rain forests of Southern Queensland and Northern New South Wales.

Hitherto, the excessive hardness of shell of some of the more widely distributed types precluded their common use. Recently, however, trees have been located which bear nuts with shells thin enough to be cracked with an ordinary nut cracker, and the cultivation of this type is extending in Australia, particularly in the coastal districts of Southern Queensland, where conditions are naturally suitable for commercial production.

This native nut is highly nutritious and is one of the richest oil-yielding nuts known, producing about 76 per cent. oil equal in quality to that of the best olive oil. An undoubted market exists for it, and success for its cultivation is assured, provided quality, uniformity, and continuity of supply are maintained.

The regional limit of successful cultivation of the nut is given as the tract of coastal country between Camden Haven, New South Wales, in the south, and Maryborough, Queensland, in the north; but a few trees are under observation as far south as Sydney. The most widely known species is *M. ternifolia,* named commonly as "Australian nut," "Queensland nut," "bush nut," "Bopple nut," or "macadamia nut."

When growing naturally in rain forests, the nut tree attains a height of from 50 to 60 feet, and branches out when above the surrounding jungle. Under cultivation or when growing out in the open, the tree is a robust, handsome evergreen with rounded top and branches clothed closely with glossy light green to dark olive green foliage. The young leaves, which are greenish yellow, yellow, pink, or red in colour according to type, are produced from terminal buds at the base of the leaf axils.

The tree is not deciduous, but a definite resting period during the colder months is observed, the time varying according to climatic conditions. Flowering may commence when the tree is from five to six years old, when an odd nut or two may set. The crop increases each year until, from ten years and upwards, good type trees produce regularly commercial quantities of nuts. The first flowers appear in early September, and flowering may continue through to October, according to weather conditions and individual peculiarities of the trees. The ever-bearing variety, *M. integrifolia* (see page 177), produces a quantity of blooms and nuts throughout most of the year. The blooms are abundant and very attractive to bees and other useful insects; consequently, pollination is largely unrestricted. Large quantities of nuts do not always mature, however, and it appears to be quite characteristic of some trees to consistently bear nuts in long clusters, while others just as consistently bear only three or four and some only one on each rachis.

The kernels are encased in a brown shell, varying from the common thick hard type to one thin enough to be cracked easily with an ordinary nutcracker. Some of the thin-shelled types, however, crack open

prematurely on the trees and the planting of these should be avoided. The nut kernel is creamy white in colour, rich in flavour and oils, and possesses excellent keeping qualities.

Plate 75.

A SEEDLING NUT TREE.—Note the length of tap root.

The whole nut, which is enclosed in a green, rounded pericarp or husk, matures in about six months after setting. A sure sign of maturity is the opening of the husk, which allows the nut to fall to the ground. Sometimes the partially opened husk, with the nut still enclosed, will fall to the ground, but this is not indicative of false maturity, and these nuts may be safely included with others which have fallen clear of the husk.

Root production in *M. ternifolia* is vigorous, the primary root at an early age being almost twice the length of the seedling's aerial growth. Secondary roots are rapidly developed, being well spaced and travelling well down into the soil, anchoring the tree firmly in its position, with a wide spread of feeding rootlets.

In the variety *M. integrifolia*, there is always a tendency for the secondary roots to be rather shallow, travelling for great distances just a few inches beneath the soil surface; consequently, great care should be taken during cultivation, otherwise many roots will be cut and so weaken the hold of the tree in the ground to the extent that it may be blown down by a strong wind.

Plate 76.
MACADAMIA NUT SEEDLINGS IN THE NURSERY BED ON THE PROPERTY OF MR. D. TULLOCH, MUDGEERABA.

A remarkable thing about the Queensland nut tree is that although it is found growing naturally where there is a good average rainfall, when grown under cultivation it is fairly drought-resistant after it has become firmly established.

When grown under suitable conditions, the trees may be expected to bear commercial crops for at least fifty years, and examples of trees forty-five to sixty years old which are still bearing large crops of nuts can be cited. It is quite probable that the life of individual trees may extend to upwards of 100 years. The Macadamia has been grown in Hawaii in small groves since its introduction from Australia in 1892. At present plantings aggregate about 800 acres, containing approximately 60,000 trees, most of which are less than fifteen years old. The plantings consist entirely of seedling trees, the seed having been selected from old trees noted for high yields of nuts of good quality. Both types—*ternifolia* and var. *integrifolia*—are grown, and their marked differences in vegetative and nut characteristics have been noted.

In Queensland there is undoubtedly scope for improvement in some of the types at present in cultivation, and all seedlings should be care-

fully watched so that any outstanding desirable characteristics may be observed, with the hope that better nuts may be evolved.

Plate 77.

MACADAMIA NUT TREE IN BEARING.—A close examination will show the clusters of nuts.

Location and Soil.

Although thriving in competition with all types of trees which make up coastal rain-forest country, the Queensland nut tree is very adaptable, and readily establishes itself under cultivation in a very wide variety of soils, ranging from open eucalypt forest to richly fertile alluvial flats. A marked antipathy to poor coastal sands has, however, been noted. Seedlings planted in these poor sands appear to stand still, or else develop into a scantily foliaged, stunted imitation of their

vigorous-growing progenitors. Under natural conditions, the tree is found growing well along watercourses in association with hoop pine, and where clay is but a few inches beneath the surface. It compares favourably in vigour also with other scrub trees, including cedar, carrabin, and similar soft woods, which are indicative of the richness of the loams supporting the heavy rain forests wherein they are found. Mild frosts do little harm, except to young growth.

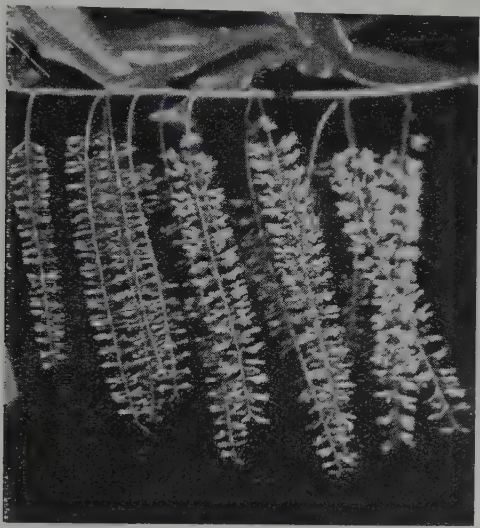


Plate 78.
THE MACADAMIA BLOSSOMS ON LONG PENDANT RACEMES.

The general recommendations in selecting an orchard site apply to a nut plantation, except, perhaps, that soil requirements need not be so exacting if the trees are to be planted with the idea of growing small crops between the rows. Furthermore, because of the length of time which must elapse before the nut trees become profitable, consideration may be given to interplanting with some kind of fruit, the economic life of which coincides with the time taken by the nut trees to attain full development. For example, nut trees may be planted between rows of bananas, papaws, and passion fruit. By the time plantations of those fruits have become commercially unprofitable, the nut trees will have become firmly established without affecting to any noticeable extent the productivity of fruit trees or vines with which they have been interplanted.

Situations exposed to high cold winds should be avoided, as ample shelter is necessary for the protection of young nuts. They are easily broken off by impact with limbs, rough edges of leaves, or just by the force of strong winds. Cold also delays the ripening of pollen, and adversely affects fertilization of the flowers, which may result in irregular setting and scanty filling of the nut clusters. Good drainage is essential for the satisfactory development of an adequate root system, and where it is lacking it should be provided. Waterlogged situations are quite unsuitable, for, even if they do not perish, the trees will not thrive.

From observation in districts which are regarded as the natural habitat of the *Macadamia,* altitudes above 1,500 feet are unsuitable for its vigorous development, and few trees are found in higher rain-forest country.

Attempts to establish Queensland nut groves at altitudes of 2,000 feet and over on rich soil have been mostly disappointing. The young trees definitely lack natural vigour in comparison with trees of similar age planted at lower altitudes. In brief, the Queensland nut thrives best under conditions commonly required for growing bananas and papaws.

For some reason, certain sections of "scrub," in districts where the trees grow naturally, do not carry macadamias. For instance, through the lower Little Nerang Valley, from Talai Mountain, in the north-east, to Wunburra, south-east, they are not to be found. Searches made through "scrubs" from the junction of the Little Nerang with the Big Nerang at Gilston up to Wunburra Mountain at the north-east of Springbrook have been made without finding a single macadamia growing. On the western side of the range in the Nerang Valley, the eastern side in the Mudgeeraba Valley, and below the junction of the two creeks at Gilston, the trees grow and flourish naturally. Grevillias and *Stenocarpus* are indigenous to the Little Nerang rain forests, but there is apparently some unsuitable condition preventing the natural distribution of the macadamias in the other regions mentioned.

Two small groves planted on the western side of Talai Mountain are producing nuts of moderate quality. But the trees have developed a spindly growth under cultivation, in contrast with the sturdy, stocky growth common in more favourable situations in other parts of the district.

Propagation.

Propagation at present in confined chiefly to the raising of seedlings. Grafting young seedlings with scions from trees possessing desirable characteristics is engaging the attention of experimentalists, who are hopeful of overcoming a natural difficulty which is in the way of complete success of this work.

Until they reach bearing stage, trees raised from seed must be regarded as an unknown quantity, because of the effect of cross pollination. No information is yet available as to the percentage of seedlings which will bear true to type and possess the characteristics so much admired in the parent tree. As a general recommendation, seed should be obtained from trees which have been selected for their vigour, productivity, habit, freedom from disease, and earliness in reaching commercial bearing, and, in regard to the nuts, the shape, thinness of shell, size of kernel, flavour, and oil content.

Most satisfactory germination is obtained by planting the nuts immediately after they fall from the tree, when at least 70 per cent. strike may be expected. Although the nut keeps well, good results have not been attained by the planting of old and indifferent quality nuts. The nuts should be removed from the husk (but not from the shell) and planted about their own depth beneath the surface in a well-prepared seed-bed, or, preferably, in boxes filled with good river bed sand or sandy loam. Seed boxes should be placed in a sheltered, warm, handy position where they can be watered regularly to keep the sand moist. Without frequent watering the young seedlings quickly die. The germination period varies considerably, even with nuts from the same tree. Thin-shell nuts

germinate much more quickly than the medium and thick-shell types; some thin-shell seedlings have been known to appear within two weeks from planting. Normally, the young seedlings should appear above ground at from thirty to ninety days, but instances of up to 150 days are known. When the young growth has hardened off, the seedlings should be lifted and planted about 1 foot apart in nursery beds and well watered. If seedlings are left too long in shallow germination boxes, the primary root reaches the bottom rapidly, becomes malformed, and the growth and development of the young plant are retarded.

Another successful method of raising seedlings is to inspect the nuts in the sand boxes at intervals of a few days after the first two or three weeks of sowing, and to remove any which are showing signs of cracking and plant them at intervals of 12 inches in a nursery bed, or in 12-inch pots, where they should remain until the young seedlings have developed sufficiently for planting in their permanent positions in the field. They must, however, be handled carefully so as not to damage the young root tip. It will be found, irrespective of the germination method adopted, that the young plants will grow better if transplanted into nursery rows from the seed bed or seed box. Root development is then more vigorous and the young trees have more room to grow. By the following spring, or when the seedlings are about six months old, they should be from 6 to 9 inches high, and, provided weather conditions are suitable, will be far enough advanced for transplanting permanently. If the weather is dry they may be left until autumn.

The germination of indvidual nuts is so uncertain that it is inadvisable to plant them direct into the field. Warmth and moisture and attention are essential for rapid germination, and these are best provided by following the procedure outlined.

Planting.

In digging the trees from the nursery rows, they should be removed as carefully as possible to avoid excessive injury to the roots. If the tap root is broken during digging, the injured portion should be cleanly cut off above the point of mutilation. The tap root normally is long, and may be pruned back in young seedlings to about 12 inches. It is advisable to soak the bed thoroughly a few hours before lifting the young trees. They will then be easier to extract from the ground without injury to the roots. The digging of a trench 15 to 18 inches deep alongside the rows and about 8 or 9 inches from the plants will simplify digging; or, alternatively, by pushing a spade down alongside the young seedlings about 8 or 9 inches from them a week or so before lifting, long secondary roots are cut back and lifting is facilitated.

The last growth should be allowed to harden off before the young trees are transplanted, otherwise many failures will result. Seedlings planted out during the rainy season—February to April—quickly establish themselves, and fewer losses will follow transplanting. There is then plenty of moisture in the soil, while frequent showers and high humidity assist the young trees to rapidly recover from the shock of disturbance.

Where different varieties are to be grown in the same grove, they should be kept separate, each variety being planted in a block or row by itself. By so doing, the nuts from each variety can be kept separate during harvesting, and this is most important, because thin-shelled nuts should be marketed separately. Furthermore, if everbearing trees are

mixed with other varieties, nuts in different stages of maturity will often be included in the same parcel, causing dissatisfaction to buyers and disappointing returns to the grower.

If the seedlings are planted with other fruits, planting distances will be more or less governed by the fruit tree rows, but experience has shown that a minimum of 20 feet and a maximum of 30 feet between nut trees will give satisfactory results. The square system of planting is most popular because of the ease with which cultivation can be carried on. In the hexagonal system, the tree rows are staggered, and permit of 15 per cent. more trees being planted to the acre. Another method of planting, which has much to commend it, is to plant 15 feet apart on the square and, after the trees are ten years old—or sooner, if the branches become interlocked—to cut out every second tree, leaving a final spacing of 30 feet by 30 feet. This method is very successful where a grove is planted with the idea of dispensing with interplanting of small crops after the third year. Under the lastmentioned method a much larger acreage return is naturally obtained during the first years of bearing, helping to offset the cost of maintaining the grove from time of planting to time of coming into profit; furthermore, the close planting for that period does not appear to affect adversely the growth or bearing capacity of the trees, while it has been suggested that pollination is improved.

To calculate the number of trees to the acre when planted on the square, multiply the distances apart in feet and divide the result into 43,560, the number of square feet in 1 acre. The following table gives the approximate number of trees to the acre when planted at the distance shown:—

Distance Apart.	Number of Trees per Acre.	
	Square.	Hexagonal.
15 feet	190	220
20 feet	109	125
25 feet	70	80
26 feet	64	73
27 feet	60	69
28 feet	55	63
29 feet	51	58
30 feet	48	53

One of the first essentials in successfully establishing a grove is to thoroughly prepare the land before planting, by ploughing and harrowing until the soil has been worked to a satisfactory tilth. Where it is impracticable to plough the land, then the work must be done by hand, a forked hoe being the most suitable implement for the purpose.

Having decided the distances apart the trees are to be planted, the next thing to do is to measure the land and peg the positions the trees are to occupy.

When digging the holes, the surface soil should be taken out first and placed on one side. The subsoil should then be well broken up deep enough to allow the tree to be planted to a similar depth to that occupied in the nursery bed. The holes need only be wide enough to allow the roots to be properly spaced without cramping. A small mound of top soil should be placed in the bottom of the hole and the roots evenly

spaced outward and downwards at an angle of about 45 degrees, the spaces between the roots being filled in with fine soil and pressed firmly. Before the hole is completely refilled, water should be applied and allowed to soak well in.

Should the weather be hot or the position be exposed to high winds, shade and supports should be provided. For shade, a piece of hessian or brush placed over stakes supporting the young trees is sufficient. A satisfactory way of providing supports is to drive three or four stakes well into the ground around each tree, and to these it is held firmly by tying with strips of hessian or galvanised iron wire slipped through pieces of rubber hosing or similar material to prevent the trunk from being injured at point of contact. The stakes also help to protect the young trees during cultivation and also from grazing cattle and other animals during the trees' early growth, when they are planted in open grazing paddocks. Apart from cattle eating the young shoots, the continued breaking of tender growth results in the development of stunted and malformed trees.

Plate 79.

Leaves, Nuts in Husks, Nuts Whole and Cracked, and Kernels.

In hare-infested districts, it is necessary to provide protection either by netting fences or wrapping the young trunks in protective material to prevent their being girdled. Hares have a liking for the recently hardened bark, and considerable losses have resulted from their activities.

Cultivation.

In the early years cultivation of the surface soil, particularly in the vicinity of the trees, is essential for the maintenance of vigorous growth. Where surface crops, such as beans and peas, or fruits similar to those

suggested elsewhere in these notes, are planted between the young trees, the preliminary preparation and subsequent cultivation of the land benefits nut trees and secondary crops alike. When the trees are five to six years old, deep cultivation in the immediate vicinity of the tree should be discontinued; however, the surface soil should be lightly worked to prevent packing, also as a measure of weed control. In older groves, animals are often used to eat down grass or succulent weed growth, and from observation this is a sound practice. Animal manure has an invigorating effect upon the trees, besides helping to keep the main lateral roots covered. As the grove ages, there is a tendency for these roots to work to the surface, due partly to natural growth and partly to the drift of surface soil, or, in the case of trees planted on slopes, erosion. When steep slopes, such as constitute the greater proportion of banana plantations, are planted with nut trees, provision should be made to prevent surface soil erosion by placing stones or logs in such a way that any wash will be caught and held in the vicinity of the trees, eventually setting up a series of small ledges and preventing the rich surface soil from being washed away. Attention also should be given to the growing of a good cover crop—legumes for preference—or, if this is not possible, succulent harmless weeds should be allowed to cover the surface before the commencement of the heavy seasonal rains. A good mulch of leaves, grass, rushes, or similar material benefits the trees by retarding weed growth, supplying very necessary humus to the soil, improving its moisture-holding capacity, and increasing its fertility.

Pruning.

In common with all other fruit-producing trees, pruning will direct the energy of the macadamia into the formation of a sturdy, stocky, well-balanced tree. Early pruning should be confined to the development of properly spaced limbs, on which the head of the tree is to be formed. If left to natural inclination, the young seedling will often continue to grow as a single stem, eventually developing into an ill-shapen, bodyless tree. Lateral branching may be induced by pinching out the young terminal buds when the seedling has attained the desired height—that is about 2 feet 6 inches to 3 feet from the ground. Subsequent growth must be carefully watched in order to prevent the young main limbs from growing immediately opposite each other, because new growth, for preference, will arise from the buds situated at the base of the terminal leaf axils. One bud should be permitted to develop; then on the removal of the remaining buds—usually two in number—fresh young growth will be promoted from buds situated at the base of leaf axils lower down the stem. Those permitted to develop should not be on the same side as other limbs, but alternatively opposite in order to overcome the possibility of splitting down the trunk during high winds or when carrying heavy crops. The young terminal growth should be regularly inspected and shortened off at intervals of upwards of 2 feet. It will then be found that secondary lateral growth will appear, assisting in the formation of a squat, bushy-headed tree possessing an abundance of short fruiting wood and preventing the domination of long, whippy growth, which is a natural proclivity of the macadamia apparently inherited from years of competition for light under natural growing conditions in the dense rain-forests. If the main stem of the tree is allowed to grow too high before being pruned, the subsequent growth often has a tendency to grow long and scantily branched, resulting in the formation of a high, ill-formed tree.

At times, young trees do not come away well on the original stem, this failure being due to a variety of causes, and a cluster of base shoots may arise as a consequence. In such cases, it is advisable to select the strongest and best-situated shoot to form the main stem of the tree, the others being cut cleanly away. Where young trees have grown very dense through too many shoots having been permitted to grow, thinning-out is necessary to open up the trees to light and air. After the foundation of the tree has been formed, little pruning is necessary beyond removal of dead or dying wood and badly placed limbs, in order to keep the centre open and promote an even distribution of fruiting on the interior.

As the tree grows older it will be possible to gradually lift the head by removing the lower limbs. Where large cuts are necessary, they should be smoothed off, and painted with tar or a good lead paint to prevent the possibility of dry rot setting in and so weakening the stem.

With care, the wounds soon callous over, and little effect is noticeable in the tree. The work should, however, be done after the crop has been removed and before the commencement of spring growth.

Plate 80.
Clusters of Nuts showing Husk's Splitting, indicating Maturity.

Bearing Habit and Harvesting.

In Australia and elsewhere it has been observed that the crop varies in quality throughout the season; usually the first few nuts which drop are poor in quality, small, and shrivel rapidly. If the trees are constitutionally strong and the season is fair, however, this represents a very small percentage of the crop.

Variations in nuts from different localities may be influenced by such factors as origin of seed, cultivation, climate, and location.

The present commercial demand tends towards the deep brown coloured, smooth-shell nut, because of its rich flavour. The medium to thin ovoid shell is attractive in appearance, with a uniformly full kernel.

There has been considerable controversy over the weight of nuts produced by a single tree, and from observations of known trees over several years the following may be taken as a fair average yield under normal conditions:—

First bearing (6 to 7 years)—3 to 12 nuts.
8 to 10 years—10 lb. to 30 lb.
12 to 14 years—40 lb. to 60 lb.

With increasing age the tree, according to local conditions, continues to increase in vigour.

In estimating yields, caution is advised. Calculations on a conservative basis allow for such contingencies as loss of portion of crop due to action of heavy winds and adverse seasonal conditions, falling of unripe nuts, and depredations of animals and insects.

Plate 81.
MACADAMIA NUT TREES INTERPLANTED WITH PAPAWS.

Normally, blossoms appear in early September and flowering may continue until early October. Large quantities of young nuts are usually set, but are somewhat reduced by the influence of natural characteristics, wind, adverse seasonal conditions, caterpillar attack, and other causes, so that a cluster is rarely found containing more than twenty nuts—the average being about ten, while it is not uncommon to find clusters of only two or three. The nuts mature in from six to seven months. They must be allowed to ripen on the tree to attain proper maturity. Immature kernels quickly become affected with a mould rendering them unsuitable for consumption, so that nuts intended for market should be fully matured. The mixing of unripe with matured nuts must be avoided.

After harvesting, the nuts should be taken from the green husks and washed to remove any discolouration caused by adhesion to the husk, thus improving its appearance and leaving the shell a clean, even brown colour. A simple method is here suggested:—When husked, tip

the nuts into a kerosene tin or similar container until it is half-filled; then pour in sufficient water to cover them. By taking the handle and twisting the tin quickly from side to side, the movement of the nuts against each other has a cleansing effect; furthermore, any hollow nuts will float to the surface, to be easily rejected. The nuts should then be placed on benches or in shallow boxes for a day or two to dry.

Before marketing, at least a month should be allowed for the nuts to "harden off." Shallow trays or boxes are suitable for this purpose, and they should be stacked in a cool, semi-dark shed out of the weather.

When marketing, two main considerations should be size of nut and thickness of shell. There should be at least two sizes or grades. Small nuts should not be mixed with large ones, because one detracts from the appearance of the other and the price is reduced accordingly. Standard corn-shellers are easily adaptable for removing green husks.

Plate 82.
The Macadamia is a Well-shaped Shade Tree and, when Grown as a Grove, Provides a Picturesque Setting for a Farm Homestead.

Thin-shelled nuts of any grade are in ready demand, and when marketed should be so labelled, provided the whole of the consignment is consistent with the label.

New nuts should not be packed with older ones. If possible, each week's harvesting should be kept separate. This ensures a uniform standard of maturity.

In most types the proportion by weight of shell to kernel amounts to about 65 per cent.; this, in addition to hardness of shell, suggests that marketing the kernels only would be the most satisfactory method. Machinery for cracking the shells and separating the kernels is now in use. Small home machines are obtainable. During the cracking process some kernels are unavoidably broken, but are acceptable by manufacturing confectioners.

Shelled kernels do not deteriorate to any appreciable extent if kept away from light and moisture, the flavour and oil content being maintained. As a roasted and lightly salted confection, they are in strong demand, and this treatment considerably enhances their naturally good keeping qualities.

CHARACTERISTICS OF TYPES OF MACADAMIA NUT.

—	*Ternifolia.*	*Ternifolia* (Mammoth).	Var. *Integrifolia.*	Var. *Integrifolia* Everbearing.
Tree	Rounded top; dense, vigorous growth	Upright; coarse, vigorous growth	Stocky; rounded top; open habit of growth	Vigorous, rounded top; well-spaced limbs plentifully supplied with fruiting spurs
Leaves	Rigid in texture; elliptical or long and narrow; excessively spiny; young leaves pink or red in colour	Coarse and large; elliptical or very long; excessively spiny; young leaves red	Rigid in texture; obovate; almost entirely free of spines; young foliage yellow to lemon	Rigid in texture; obovate or elliptical; free of spines; young foliage lemon green to yellow
Flowers	Pink to light reddish brown; blooms August-October	Pink; blooms August-September	Creamy yellow; blooms August-September	Creamy yellow; blooms periodically from June through to March
Bark	Light greyish green or brown	Browny grey	Greyish to green	Grey to green.
Age of bearing	5 to 6 years	5 to 6 years	6 to 7 years	6 to 7 years
Fruiting	One crop annually	One crop annually	Mostly one crop annually; sometimes a light second crop is set	Bears flowers and fruit more or less all the year
Shell and texture	Smooth to knobby; sometimes flecked; thick shell tough and coarse; thin shell smooth and fine; brown colour	Knobby, uneven surface; medium to thick shell; brown colour	Smooth surface; medium to to thick; brittle; brown colour	Smooth surface; medium thickness; brittle; brown colour
Nut unshelled	Ovoid to elliptical	Ovoid to elliptical	Mostly spherical	Ovoid to spherical
Quality	Fine; rich in oil	Brittle; rich in oil	Texture finer than *ternifolia*; rich in oil	Fine texture; rich in oil
Pests	Nut-borers, caterpillars, leaf-miners	Nut-borers, caterpillars, leaf-miners	Nut-borers, caterpillars, leaf-miners	Nut-borers, caterpillars, leaf-miners

Fertilizing.

No fertilizer experiments have been made to determine a suitable formula, but during the early years of growth organic manures and nitrogenous fertilizers should prove valuable as a stimulus, and will assist in maintaining a high humus content and fertility of the soil. Seedlings lagging in growth after transplanting will benefit from a dressing of blood and bone at the rate of 4 oz. to each tree in September and again in March.

Diseases and Pests.

Macadamia trees appear to be free from most forms of disease, but the larvæ of a moth (*Xylorycta lutœtactilla*) may cause considerable damage. Information on these matters is obtainable from the Department of Agriculture and Stock, Brisbane.

Macadamia ternifolia var. integrifolia.

Some doubt exists as to whether this is a variety or merely a type, but for the purpose of these notes the more familiar term "variety" is used for distinction between the two—i.e., *M. ternifolia* and *M. ternifolia* var. *integrifolia*. The production of smooth-shelled nuts has been said to be restricted to the var. *integrifolia*. Such, however, is not the case, because trees of *M. ternifolia* can be cited as producing nuts with a smooth and brown-flecked shell. In common with *M. ternifolia*, a wide variation has been observed in the shape of leaves and nuts of the var. *integrifolia*.

The habit of bearing more than one crop a year is confined to var. *integrifolia*. Despite this heavier cropping, however, under natural conditions the most widely distributed variety is *M. ternifolia*, suggesting the possibility of its requiring less exacting soil conditions, although under cultivation *M. integrifolia* readily becomes established and flourishes equally as well as *M. ternifolia*.

The "Everbearing" type may carry blossoms and nuts in different stages practically throughout the year, the main flowering periods being June and November. The nuts are usually ovoid in shape, with brown, smooth shell of medium thickness and borne similarly to those of *M. ternifolia*. Maturity indications are identical and extend over a similar period of time. The kernels fill the shell and are rich in flavour, with an oil content equal to all other varieties. The tree is consistently robust, with full rounded top; main and secondary limbs growing somewhat laterally maintain an open habit of growth admitting light to the interior, thereby inducing a fairly even setting of nuts over the whole tree.

Possessing an extensive root system, development is mostly of a shallow nature, and young trees in exposed positions, unless well staked, often blow over during wet, stormy weather; while in aged trees the main lateral roots become exposed near the trunk, necessitating protection to keep them covered with soil. Should the roots become badly exposed through erosion and natural development, a diminution in cropping will be observed. On the roots being well covered again, a return to consistent heavy bearing is the usual result.

With this variety some immature nuts are always gathered, as it is difficult to harvest the whole crop at the correct stage; immature nuts are unpalatable and deteriorate quickly. Care should be taken to exclude these from matured nuts; otherwise they may adversely affect the disposal of the whole crop.

Propagation.

Propagation is mostly from seed, which should be planted as soon as possible after falling from the tree. Germination may extend from 30 to 120 days. When selecting seed from the "Everbearing" variety, best results will be obtained from seed which matures during April-May. If the nuts are planted immediately, young seedlings are then sufficiently well advanced for planting out during the following autumn.

Seedlings transplant as readily as those of other varieties under suitable conditions, and when once properly established rapidly develop into attractive and shapely trees.

Acknowledgments.

The assistance of the undermentioned growers in supplying information used in the preparation of these notes is cordially acknowledged:—Messrs. W. Hill and H. J. Latimer, of Gilston; Messrs. A. Barns, L. Grimshaw, and D. Tullock, of Mudgeeraba; also that of Messrs. G. F. Hinde, of Southport, and J. H. Gregory, of Brisbane, in supplying photographic illustrations.

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GROW MORE KURRAJONGS.

Grow more Kurrajongs. Nothing is better generally for inland work, and if good soil and decent growing conditions can be assured during their infancy, you can forget the story that Kurrajongs are slow growers.

By me, I have a report from the north-western slopes (New South Wales) of a young kurrajong tree which grew 10 feet in a little over twelve months. Is that slow? It had fertile soil, well prepared, and ample water to keep it going along steadily. The kurrajong makes a noble tree, is decorative, hardy, and can be used for stock food in emergency.

It responds well to cutting and should be pruned annually after flowering to prevent the heavy seed-setting, which somewhat exhausts the tree. This during the earlier years.

Along the coastal areas a variation can be made from jacarandas, with some of our native brush-forest trees—brilliant colourists and grand decoratives . . . .—*L. B. in the "Sydney Morning Herald."*

Ropiness in Milk and Cream.

M. J. GRIFFITHS, B.Sc. (Dairying), Dairy Research Laboratory.

MANY inquiries as to what ropiness really is and how it may be prevented have reached members of this laboratory during the past two years, and a number of samples have been examined for this defect. Some information, therefore, is put forward regarding its nature and the means of controlling it on the farm, which may be useful to the milk trade as well as to the cream supplier who experiences difficulty with regular or irregular outbreaks of ropy cream.

Very frequently in Queensland, among the cans of cream graded down to second-grade on the butter-factory platform, one or more is to be found which shows a typical slimy or ropy condition. This cream may otherwise be of good flavour and quality, but the grader has been forced to reject it because its condition makes it unfit for manufacture into choice-grade butter. Ropiness is also met with as a milk defect and has been known, though fortunately this is not common, to cause serious loss of trade through the housewife's confidence in her milk supply being destroyed. She at once associates the abnormal slimy condition of the milk with some disease, and, even though it may occur only once or twice, she is naturally suspicious of the quality of the entire supply and often decides to "change the milkman."

SYMPTOMS OF THE DEFECT.

In mild cases of ropiness, the milk or cream will show only a slight smooth thickening, viscosity, or sliminess, which is quite distinct from, and must not be confused with, the stringy appearance, often accompanied by small lumps, which is common in cases of mastitis. A ropy condition is of bacterial origin, but it is rarely associated with disease and often neither the flavour or aroma are altered. Often, again, unclean organisms accompany the ropy bacteria, when, of course, the flavour is deteriorated. Sometimes a can of milk or cream will show ropiness only at the surface, the lower portion being unaffected; more commonly the whole bulk will be affected (see Plate 87). Sometimes the milk will remain normal until delivered to the customer, or cream until it reaches the butter factory, but, if kept for an hour or two longer, the ropiness will become obvious; if kept after this—for twenty-four or forty-eight hours—the ropiness may completely disappear and souring or other deterioration take place.

OCCURRENCE.

The incidence of ropiness in Queensland is not limited to any definite season of the year, though a larger number of complaints appear to occur during the summer months. This may be an indirect effect of low water levels. The temperature at which bacteria causing ropiness may grow and flourish is not confined within definite limits owing to the fact that a number of different species have been found to be responsible for this trouble. Some grow well at 50 deg. F., so that even cooled milk and cream are not immune, while others develop well at 70 deg. and 80 deg. F., or even higher. As with any bacterial taint, development may be either delayed or prevented altogether if conditions are such that other organisms, as, for instance, the souring group, gain the upper hand, and, developing more rapidly, leave no food material available for the rest.

CAUSES OF ROPINESS.

Members of the lactic acid (souring) group are occasionally responsible for a ropy condition in dairy products; in addition to these, certain micrococci, members of the coliform and aerobacter group and others, are capable of producing slime either from the protein or more usually from the sugar (lactose) present. This slime is formed by each

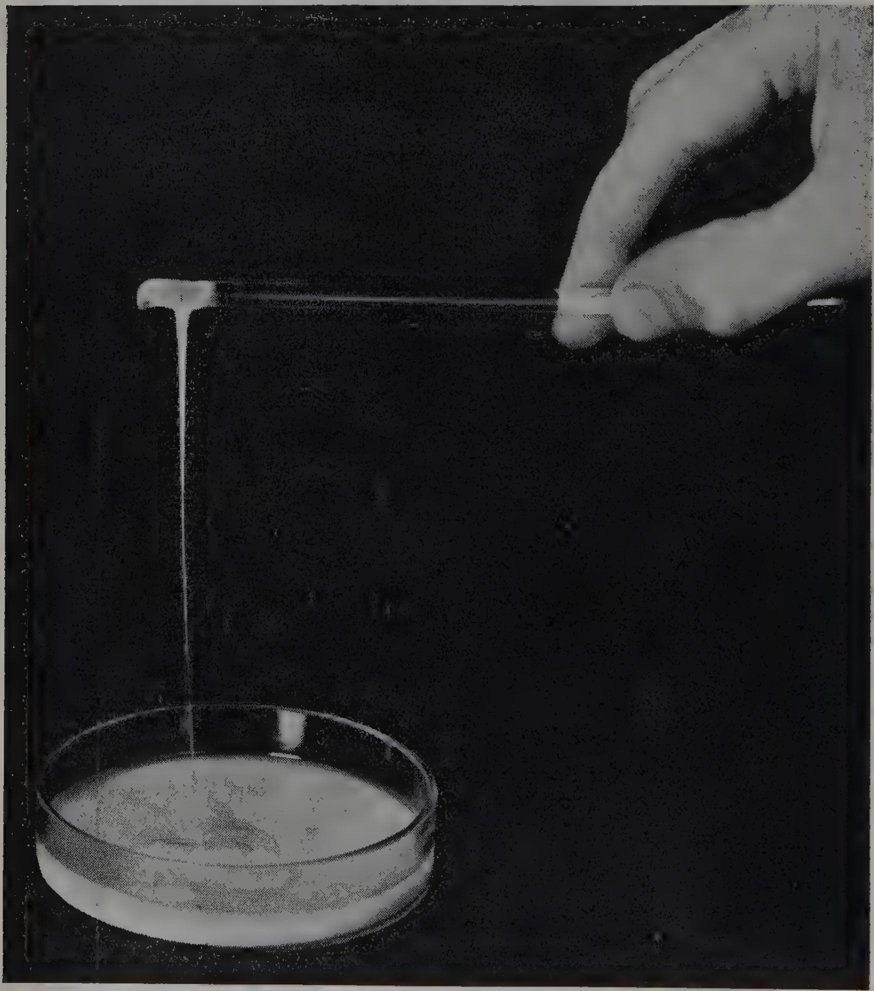

Plate 83.
ROPY MILK.—Sterile milk inoculated with farm water from Gladstone district, May, 1939.

cell in the young state, and under the microscope appears as a jelly-like capsule enveloping it. The illustration (Plate 85) shows a twenty-hours-old culture of a lactose-fermenting rod (an *Aerobacter aerogenes* strain) recently isolated from a water sample received from the Gladstone district, grown in sterile milk. As the culture becomes older more slime is formed (in a culture such as this a distinct joining-up of the

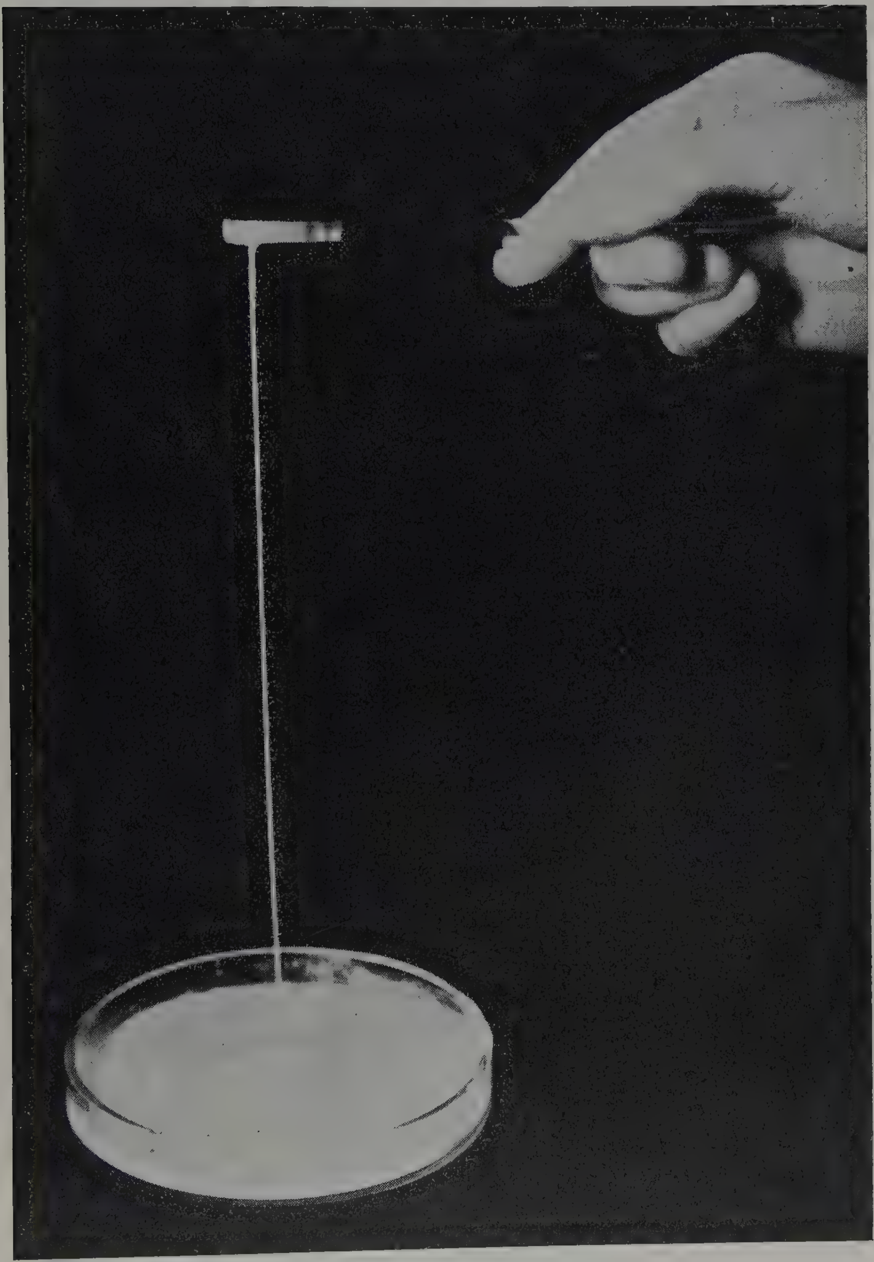

Plate 84.

Ropy Cream.—Cream inoculated with culture from farm water, Gladstone district, May, 1939.

single cells into groups or chains may be seen) so that, while the cells may remain distinct, they are bound together by a network within the gel (see Plate 86). In the case of streptococci, this is not so obvious since the organisms are already in chain formation. It is this network that enables the milk or cream to be pulled out in strings or ropes sometimes up to 2 or 3 feet in length. Plate 84 shows a cream inoculated with the same organism pulled out to about 9 inches in a uniform thread, and Plate 83 a milk showing nearly 6 inches of "rope." This capsulation as it is called is a temporary stage in the life of the organism, and will pass as the cells become older. Unfortunately in practice the dairyman whose bails and dairy have become infected with the trouble finds that it does not disappear, and this is because twice a day fresh milk is available for growth and activity, young cells are continually produced, and multiplication will be regular provided that temperature conditions are suitable.

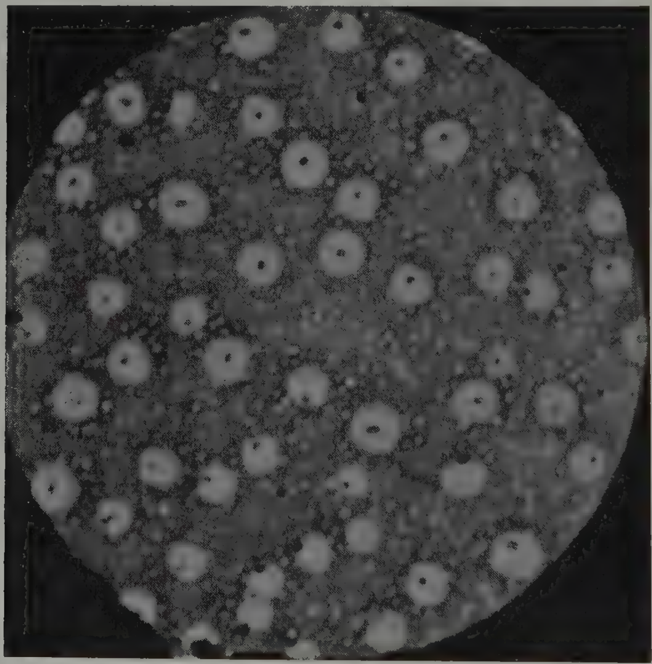

Plate 85.
TWENTY-HOUR CULTURE OF *Aerobacter aerogenes* STRAIN ISOLATED FROM LAGOON WATER, SHOWING CAPSULES FORMING.

SOURCES.

Until the source of the troublesome bacteria is known to the farmer, his dairy will not be completely freed from the defect, and the first step is to explore the possible sources. Among the commonest are the following:—

1. Lagoon or dam water, stagnant or slowly-flowing.
2. Water remaining stagnant in paddocks after flooding.
3. Neglected stock yards where manure accumulates.
4. Rain-water tanks contaminated by dust.

From these original sources the bacteria find their way into the milk by the following means:—

1. On cows' coats, udders and tails, if they have waded in the water.
2. In the first-drawn milk of each cow.
3. Dust blowing direct from yards into bails or dairy.
4. Through washing utensils with impure tank water.
5. Occasionally, through the splashing of water used for cooling purposes, or leaking of a cooler.

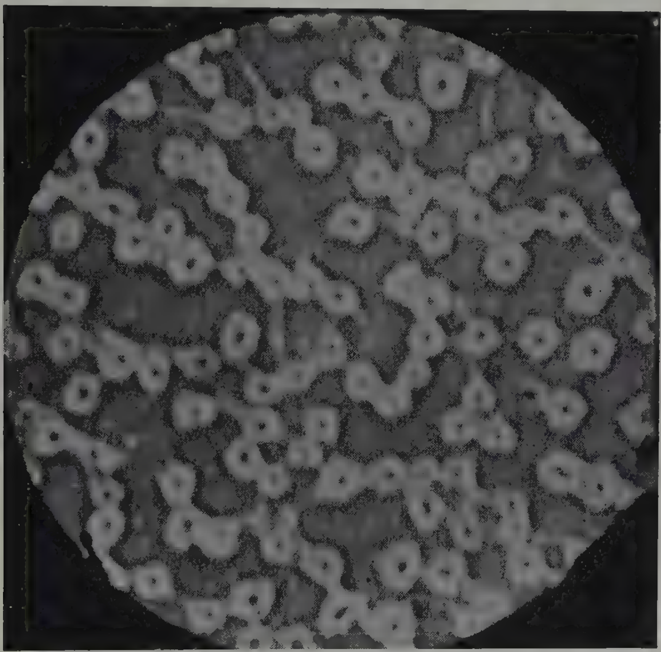

Plate 86.

TWENTY-SIX-HOUR CULTURE OF *Aerobacter aerogenes* AT 25 DEG. C., SHOWING CAPSULES STARTING TO JOIN UP TO FORM "ROPE."

CONTROL ON THE FARM.

Once the source has been determined, precautions can be taken to ensure that further infection is not allowed to enter. At the same time control measures in the dairy, which are very simple but which must be rigidly applied if the trouble is to be completely cleared up, can be put into practice immediately.

1. Fence off stagnant water, as far as possible, from dairy cattle, and provide a water trough for drinking.
2. Remove manure regularly from yards, and make a good surface so that mud and dust are minimised.
3. Clean the bails thoroughly, including floor, roof and walls; limewash roof and walls.

4. Examine milking machine parts, especially rubbers, and every utensil used for milk or cream. Replace or have repaired any which show crevices or cracks. (Kerosene tins, however clean, will spread ropiness regularly owing to their open seams, and they should not be used in the dairy except for skim milk.)
5. Boil all wash-up water if this is a suspected cause; wash utensils thoroughly.

Plate 87.

A CAN OF CREAM SHOWING "ROPE" WHEN STIRRED WITH A PLUNGER.

6. Sterilize *all* utensils and milking machine parts in contact with milk, either by steaming or by immersion in boiling water for at least 10 minutes, and allow to dry—do not use cloths. (Cans may be effectively steamed by inverting over a perforated lid on the copper.)

7. Wash cows' udders thoroughly—a little disinfectant may be used in the water—and boil the cloths each day.
8. Discard two or three streams of milk from each teat, before milking, into a bucket or billy kept for the purpose.
9. Pasteurization of milk (to 145 deg. F. for 10 or 15 minutes) is an emergency control measure which will destroy ropy organisms, and which may be useful temporarily to the milk retailer to prevent loss of trade.

The bacteria are, for the most part, not resistant to heat, and are, therefore, readily destroyed by boiling water and steam—the slime, however, does form a protective layer around each cell which will enable any bacteria lodged in crevices of utensils or machine rubbers to survive and multiply in the next batch of milk. Utensils in good condition are, therefore, extremely important. Two persistent cases of ropiness recently came to the writer's notice, one from the Woodford district and one of a supplier to a Dalby factory, which were due to the daily use of kerosene tins for cream, and, so long as farmers persist in using second-rate dairy utensils, which include worn machine rubbers as well as cracked buckets and cans, they cannot reasonably expect to receive a choice grade for the article they produce.

If the abovementioned points receive attention, it should be possible to arrest an outbreak of ropiness immediately, and provided that this is followed up with daily care in production methods, a recurrence of the trouble should be avoided.

BORDER LINE CREAM.

Every factory manager should formulate a policy in regard to the lowest quality cream that can be manufactured into choice quality butter at his particular factory. Modern methods of manufacture and factory equipment have done much to enable the utilisation of cream which a few years ago would have been rejected. Nevertheless, the dairying industry still offers no exemption to the general rule—that the quality of raw materials directly influences the character of the manufactured product. The addition of a few faulty cans of cream to a vat may thus cause the spoilage of otherwise choice quality butter. Only a thorough knowledge of the origin and nature of a given defect can help in determining the fate of doubtful cream.

There is a limit to the capability of machinery and manufacturing technique to offset defects in cream quality, and no factory can afford to slur over defects in the cream received. Any laxity in this respect is really doing the farmer a disservice, for he may remain unaware that better quality cream is required, and takes less, instead of more, care on the farm.

First-quality butter can only be obtained when the farmer realises that the remedy for cream defects is essentially his responsibility.

Bacterial Spoilage of Processed Cheese.

M. J. GRIFFITHS, B.Sc. (Dairying), Dairy Research Laboratory.

DURING the recent summer, a large quantity of the output of cheese processed on three separate days in one month was returned to the factory concerned, with a taint so obnoxious as to make it entirely inedible. This serious taint developed two to three weeks after manufacture, the cheese showing obvious deterioration, either slight or advanced, but always accompanied by a penetrating putrefactive odour. From this cheese an anaerobic spore-forming organism was isolated.

Mean atmospheric temperatures in Brisbane at this period (December-January) showed a high average, being 72·8 deg. F. for the month of December, and 78·1 deg. F. for the month of January, with average maximum readings of 86·4 and 85·6 deg. F., and any bacterial defect would be likely to show rapid development. For this reason, although local complaints were few, many were received from other states, and from the north, where the cheese had been for a considerable time in transit.

NATURE OF THE DEFECT.

On removal of the tinfoil the cheese showed circular softened and bleached patches on the surface, and on cutting through the block at different points these patches were seen to be present throughout the whole length and depth of the block. In advanced cases, these areas were as much as 1½ inches in diameter and had become joined so that the major portion of the cheese had a bleached appearance and crumbling texture, and the minor part normal colour and firmness; in less fully-developed cases, the areas measured ¼ or ½ inch. It was possible to distinguish in the centre of some of the affected areas a small dark slit, which it is thought may possibly have been caused by the formation of gas. The appearance of the cheese is shown in Plate 88. In all cases, including milk cultures, a penetrating obnoxious odour, which may, perhaps, best be described as fæcal, accompanied the bleaching and crumbling.

FACTORY TREATMENT.

The origin of the raw cheese used in manufacturing the processed article on the three days in question, 13th, 14th, and 19th December, 1938, was investigated, and it was found that supplies from only one factory were common to all three days, cheese from two or three other different factories being used blended with it.

The whole of the cheese was processed under vacuum, at a temperature which would have a pasteurizing effect on the bacteria present. The taint was found to be confined to the 8-oz. packet size, which comprised the major part of the output, and for which an old machine was sometimes used. Precautions were taken for extra cleaning and sterilization of the factory plant as soon as the taint was found to be bacterial.

ISOLATION OF ORGANISM.

Emulsions were made from several affected patches of different samples of the cheese in sterile saline by grinding with sterile sand in a pestle and mortar sterilized by igniting with alcohol. Double plates

were poured from these emulsions, using whey agar pH 6·6, and incubated at atmospheric temperature (28 deg. C.). Both these and slope cultures on whey agar gave no growth, but shake cultures, using the same medium, showed enormous cleavages due to gas formation after four days, accompanied by yellowish fimbriate colonies in the lower half of the agar. A stab in whey agar revealed good growth under anaerobic conditions at the same temperature. The organism also grew well but not

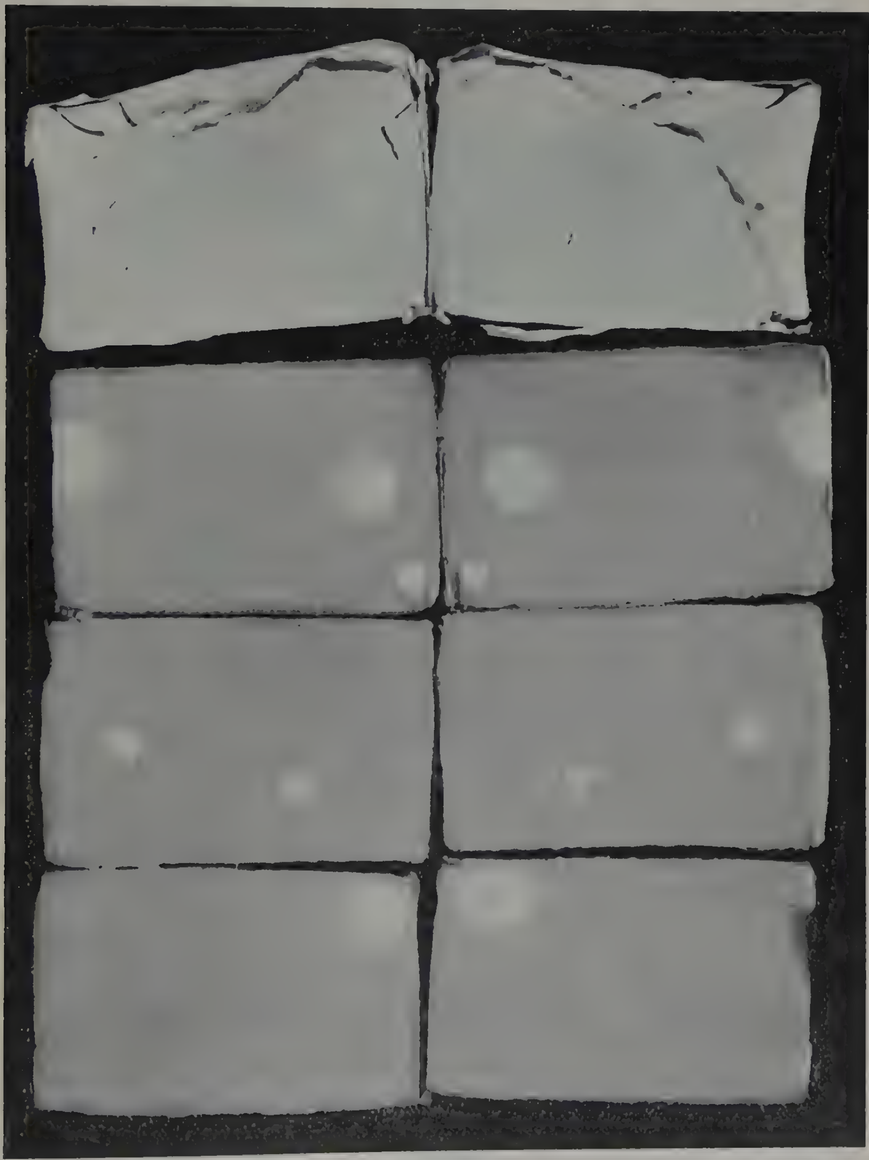

Plate 88.

Processed Cheese showing Deterioration due to Infection with Anærobic Spore-forming Organism.

so readily on standard nutrient agar. Impression preparations made direct from small infected areas showed the presence of (*a*) isolated diplococci, and (*b*) slender rods singly and in pairs with free oval spores.

Seven deep colonies were removed from the shake culture and broken up with difficulty on a slide for microscopical examination. All these showed apparently identical free spores in large numbers, with a small proportion of rods, some showing bulging, with partially and fully-developed terminal spores. Plates 89 and 90 illustrate two stages of sporulation, with a number of immature rods. The stab culture was also examined and appeared to be a pure culture of the same sporing rod.

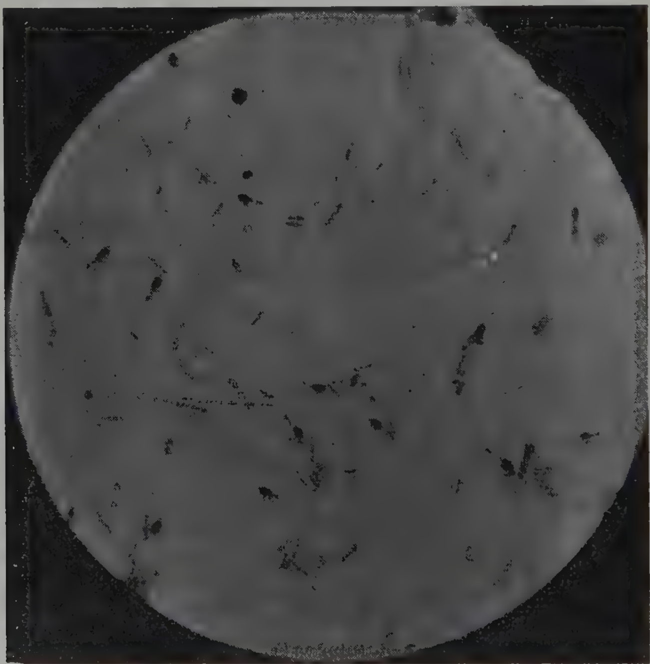

Plate 89.

CAUSAL ORGANISM SHOWING SWOLLEN RODS WITH INCIPIENT SPORES THREE DAYS IN WHEY AGAR AT 37 DEG. C.

Anaerobic cultivation, at 37 deg., 28 deg. and 20 deg. C., of the organism isolated from one of the abovementioned deep colonies growing in a whey agar shake culture was undertaken, using a few crystals of pyrogallol moistened with $\frac{N}{1}$ NaOH in a double-plugged test tube closed with a vaselined rubber stopper. This method gave very satisfactory results for individual cultures. Where it was required to incubate a large number of tubes, a wide-mouthed glass jar was inverted over a beaker containing the inoculated tubes, which stood in alkaline pyrogallol. The whole was placed in a glass dish and sealed from the air with liquid paraffin. The organism proved to be a strict anaerobe with an optimum temperature of 37 deg. C.

The thermal death time of the sporing culture was investigated by the following method:—A suspension was made in 0·9 per cent. saline and a number of capillary tubes were filled and sealed. Two of these were heated in water for varying times at different temperatures. They were then removed, sterilized by placing in alcohol for thirty seconds, and broken with sterile forceps into separate tubes of previously boiled and cooled litmus milk, which were plugged, treated with alkaline pyrogallol and sealed before incubating at 37 deg. C. They were examined after ten days and three weeks. Results are given in Table I.

TABLE I.

Thermal Death Point of Spores.

Time.	Temp. °C.	(°F).	Growth in Litmus Milk. Tube 1.	Tube 2.	
10 min.	70	(160)	+	+	
10 min.	82	(180)	+	+	
10 min.	93	(200)	+	+	
10 min.	100	(212)	+	—	(capillary not broken)
15 min.	100	(212)	+	+	
20 min.	100	(212)	—	—	
25 min.	100	(212)	—	—	
30 min.	100	(212)	—	—	
1 hour	100	(212)	—	—	

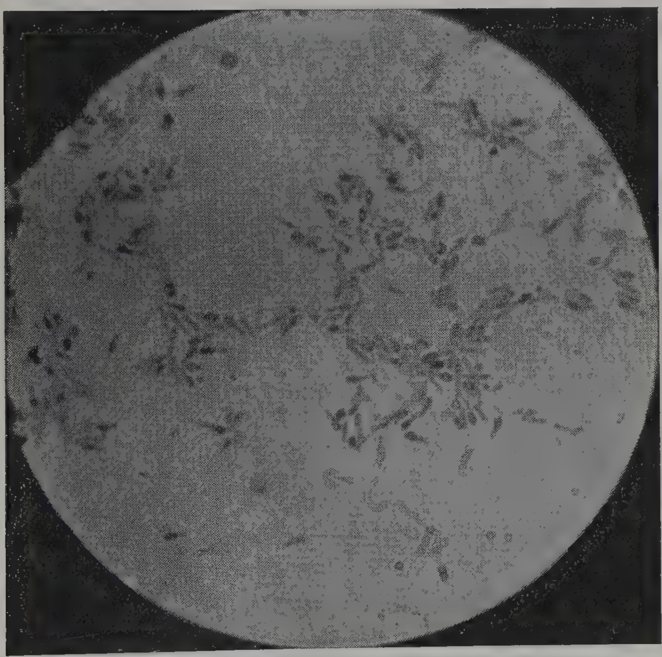

Plate 90.

Causal Organism showing Rods and Fully-developed Spores Five Days in Whey Agar at 37 Deg. C.

CULTURAL AND BIO-CHEMICAL CHARACTERISTICS.

Microscopical appearance.—Rod, approximately 6 x 1, occurring singly and occasionally in pairs, sporing after three to four days at room temperature.

Size.—1·4 x 0·3 to 2·5 x 0·4 microns.

Spores.—Oval, terminal, rods swollen at sporulation.

Motility.—Active.

Gram stain.—Positive, becoming negative.

Thermal Death Time (spores).—100 deg. C. for twenty minutes.

Optimum Growth Temperature.—37 deg. C. Will grow also at 20 deg., 28 deg., and 46 deg. C.

Nutrient or Whey Agar Slope.—No growth.

Nutrient or Whey Agar Stab (Anaerobic).—Good after three days at 37 deg. C. Filiform growth.

Nutrient or Whey Agar Shake (Anaerobic).—Well-defined deep colonies; tough, granular, fimbriate, yellowish in colour.

Litmus Milk.—Bleaching coagulation, complete peptonization with gas and putrefactive odour, rapid at 37 deg. C.

Blood Serum.—Good growth with slow liquefaction and clearing.

Coagulated Egg Albumin.—Slow softening and clearing, complete after five weeks at 25 deg. to 28 deg. C.

Carbohydrates.—Acid and gas in dextrose, maltose, lactose, slight fermentation of adonite, starch not hydrolised.

Nitrates.—Not reduced.

Indol.—Not formed.

Odour.—Putrefactive or fæcal.

From the above characteristics, the organism appears to be a strain of *Clostridium coagulans,* described by Bergey (1) as of fæcal origin.

REPRODUCTION OF THE TAINT.

An effort was made by inoculating spores of the organism with a sterile needle direct into a fresh block of processed cheese, to reproduce the taint. This failed it is thought on account of conditions being insufficiently anaerobic, although rods and spores of the organism were isolated after five weeks from one stab. A second attempt was made, in which fresh processed cheese was steam-heated to melt it and 1·5 ml. of a milk culture containing spores was added and mixed in while the cheese was still semi-solid. The cheese was divided into eight portions, which were placed in small sterile porcelain crucibles and sealed with paraffin wax immediately. After three weeks, the first two of these were examined. Both had the characteristic putrefactive odour, with streaks of pale colour running through them, but no localised zoning; a characteristic coagulation and digestion were given in milk, and plectridia were isolated from portions of this "cheese." The remaining six "cheeses," unfortunately, showed the presence of mould under the wax, due to the ravages of mites, and had to be discarded.

DISCUSSION.

Infection of processed cheese with *Clostridium coagulans* does not appear to have been experienced by other investigators, and, since in the instance described the trouble disappeared completely and no more has been experienced during the last six months, it was not found possible to trace the source of the organisms. They may have come through in the raw cheese of one factory whose output was not made from pasteurized milk and some of which had recently been condemned as unfit for use. This is considered to be the most likely source. Alternatively, infection from a worker might be responsible, and, once the *Clostridia* reached the vacuum machines in the factory, they might remain protected in crevices under conditions sufficiently anaerobic for growth. After preliminary investigation of the taint, a daily check of production was started at the factory by incubating packets of cheese from each day's make at 37 deg. C., in order to encourage the appearance of the defect as quickly as possible. No further trace was found of the trouble, which appears to have been an isolated case.

Bleaching of annatto-coloured cheese due to bacterial activity is well known, and has been associated with both oxidation and reduction (2). Completely anaerobic conditions are present in a cheese preheated, processed under vacuum and immediately packed, and a moderately resistant sporing anaerobe, which can cause degradation of casein at atmospheric temperature, is dangerous under such conditions. The end-products formed were not investigated—milk was completely digested in 5 to 6 days at 37 deg.—and the putrefactive odour, which suggested scatol, was present in all cultures grown in the media mentioned. There was only a slight difference in pH between the affected areas and the normal cheese.

SUMMARY.

1. A case of bleaching and taint production in processed cheese has been described.

2. The responsible organism, a strictly anaerobic sporing bacillus, whose characters correspond to those of *Clostridium coagulans* (2) was isolated.

3. Cultural and biochemical reactions of this organism are given, including the thermal death point of the spores.

4. The source of infection was not found, but is likely to have been milk of inferior hygienic quality used for making some of the cheese used in processing.

REFERENCES.

1. D. H. Bergey. Manual of Determinative Bacteriology. Family V., Genus II., No. 36.
2. G. M. Moir. J. Dairy Research 4. 1932-33, p. 240.

WHEN THE COW IS IN FULL MILK.

A cow usually reaches the peak of production six or eight weeks after calving. Then she begins to drop off. The drop varies with the individual cow, but the average is about 2 per cent. a week. It cannot be prevented, but it can be kept at a minimum by proper feeding.

Trials with Gambia Pea.*

H. W. KERR.

IN recent issues of the *Bulletin* reference has been made to the promise shown by a species of Crotalaria—which we have called "Gambia pea"—as a long fallow green manure crop. During the past summer the small quantity of available seed was allotted to the planting of small plots on selected farms in a number of the major cane growing areas. The seed was not of specially high quality, as much of it had been gathered at the Bundaberg Station during showery weather and mould damage was considerable. Allowance was made for this defect in seeding the trial areas, but in practically all cases a good stand was obtained.

The seed is very small, being appreciably smaller than the Poona pea; if an even broadcast could be assured, less than 10 lb. would seed an acre of land. Our experiences were that it germinated rapidly where soil moisture was favourable. It soon became established but thereafter followed a period during which the young plants appeared to "hang fire," while weeds and grasses threatened to choke out the young crop. However, the pea suddenly displayed a vigour of growth which was remarkable: by February (3 months after planting) it had attained a height of over 5 feet in certain plots, without showing any signs of flowering. Where the seeding had been heavy, and the individual plants were overcrowded, the growth was almost entirely confined to a single stem with few small branches. But where space permitted, the plants branched profusely, and in all cases provided an excellent cover (*see* Plates 91-93).

Plate 91.
A GOOD CROP OF GAMBIA PEA AT THE MERINGA STATION, FIVE MONTHS OLD.

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* From *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), July, 1939.

Plate 92.
Another Crop of Gambia Pea on the Farm of Mr. A. H. Reichardt, Silkwood.

By April the pea plants on some of the trial plots were 7 feet high and seeding. The seed pods are short and thick, and are arranged in clusters at the upper extremity of the main stem. Normally the crop would be ploughed under before this stage; but we are attempting to save as much seed as it is possible to obtain, in order that a more extensive distribution may be made during the coming spring. However, even at this stage the main stems were not so excessively woody that they would not decompose at a reasonable rate when ploughed under.

Plate 93.
An Excellent Crop of Gambia Pea on Mr. T. Chappell's Farm, South Isis.
It Yielded 25 Tons of Green Matter Per Acre.

Sections of the crop were cut off at ground level on several of the plots, and the weight of green matter per acre estimated. Samples of the material were later dried and analysed for nitrogen content. Results of some of the yields and analyses are shown in Table I.

TABLE I.

YIELDS AND COMPOSITION OF GAMBIA PEA CROP.

Location.	Weight of Green Matter per Acre.	Nitrogen Content of Green Matter.	Equivalent to Sulphate of Ammonia per Acre.
	Tons.	%	Lb.
Meringa	24·0	..	..
South Johnstone	23·2	0·40	980
Childers	24·6*	0·49	1,260*

* In addition, leaf mould which had fallen from the plants provided further 1¾ tons per acre (dry).

The influence of such a body of material on the fertility and humus content of the soil will be readily appreciated. Certainly the plant cane which follows should find in the soil an abundance of available nitrogen for its full requirements. It will be borne in mind that the major portion of this nitrogen (equivalent in one case to over 260 lb. of sulphate of ammonia per acre), was gathered from the air by the root nodule bacteria associated with this legume, and represents a net gain to the soil. The roots of all plants which were examined carried clusters of well-formed nodules, although no steps had been taken to inoculate the seed before sowing.

It is well recognised that Gambia pea possesses pronounced drought resisting qualities, and in this respect should be specially valuable for spring planting in the Queensland cane areas. Moreover, it is found that when cut off near ground level at a certain stage of growth, it will ratoon strongly and provide a further crop without the necessity for re-seeding. This is a particularly valuable point, for it suggests that the species is ideally suited for long fallowing purposes. With the introduction of rigid production control in all districts, many farmers will find that they have excess areas which could well be treated to say —18 months fallow. If such a policy were regularly practised as each block is ploughed out, and leguminous cover crops retained on the land throughout the resting period, the fertility of the soil would be speedily built up. Further, it would be found that substantial savings could be effected in the purchases of artificial manures; following such a fallow, the plant crop of cane may require little if any fertilizer, and ratoons only would require this treatment.

Finally, it should be pointed out that the blocks selected for the trial plantings represented a fair range of soil types, and were not confined to the better lands. On one dry red volcanic soil farm, the grower broadcast the seed on what he considers the poorest block on the farm. A heavy crop resulted—up to 6 feet in height—and the cover was excellent.

The Development and Value of Irrigation in Southern Queensland.*

C. G. STORY.

IRRIGATION water has aptly been termed "the lifeblood of the plantation," especially when sugar-cane is the crop concerned, as this is a crop which will literally grow in proportion to the water supplied to it when the mean air temperature ranges above 70 deg. The sub-tropical southern area, with an annual average rainfall of 44 inches, is highly dependent on the providence of nature if favourable crops are to be produced, as was shown by the disastrous season experienced in 1931-32. The realisation that irrigation is one of the safest insurances a farmer can have if he wishes to be certain of a favourable crop every year, is gaining in the south, where even under the conditions existing during the last two years, the rainfall, although plentiful, has been late, and due to dry checks experienced in late spring and early summer, when temperatures were admirable for growth, many tons of cane have been lost under dry farming conditions, due both to checking of growth in the young cane, and loss in standover crops.

This loss demonstrates clearly that irrigation is practically essential to this area if production, as warranted by the soil and varieties, is to be obtained. Taking a case in support of this, the South Kalkie area was, a few years ago, an area from which the mill could not be assured of a reasonable crop, but to-day the opposite situation prevails, due to the fact that the district is fast becoming an irrigation centre with a high farm average of cane per acre, with the present day varieties.

The results achieved by the large plantations prove conclusively that irrigation may be successfully conducted on a range of soils in the southern area. These plantations, which differ in the method of obtaining their water supply, have carried out a considerable amount of experimental work on irrigation, and have set a high standard for irrigation practice.

Excluding plantations, there are upwards of ninety irrigation plants in the Southern district, a large proportion of these being in the Millaquin area. The following may prove of interest as showng the distribution of plants in some of the mill areas:—

Millaquin area	45 irrigation plants.
Qunaba area	5 irrigation plants.
Fairymead area	5 irrigation plants.
Isis area	3 irrigation plants.
Bauple area	5 irrigation plants.

In the Bingera area upwards of thirty farmers use irrigation.

Most of the irrigation plants in the south are located on forest lands, on which are very often available large supplies of good quality water at shallow depths. Further, this particular type of soil possesses another advantage with irrigation, as it generally gives good returns from applications of sulphate of ammonia and mixed fertilizer rich in superphosphate, which fertilizer materials are generally less costly than those necessary for volcanic loams.

* From *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), July, 1939.

Just as soil types in the south vary, so does the quality of water found in the areas embraced by these soil types. Waters obtained on the red volcanic soil area are, on the whole, unsuitable from an irrigation point of view, as very few samples show an analysis below 50 grains of salt per gallon, and some are as high as 400. Up to 100 grains per gallon is considered safe, but the use of any thing over this figure might give rise to trouble. At the Southern Sugar Experiment Station the bore water contains only 3 grains of salt per gallon, and is therefore excellent quality for irrigation purposes. Unfortunately for most of the Woongarra area, large supplies of underground water suitable for irrigation purposes are apparently not available at pumping costs which would be economical.

Analyses of waters from forest lands show that the salt content varies from 3-15 grains per gallon with an average of 7 or 8 grains per gallon. The water found below old alluvial country by one of the plantations in the Bundaberg district is, on analysis, suitable for irrigation.

Waters in the Bauple area generally contain an excessive proportion of magnesium salts which in time may have a deleterious effect on the soil, if not corrected by suitable soil treatment. The same remarks as apply to the red volcanic soils of Bundaberg apply also to those of the Isis area.

The soil is the reservoir in which is stored the water which falls as rain or is applied as irrigation. Different soils vary in their water retentive capacity, while they also differ in the proportion which they can yield up to the crop for growth purposes. The difference between the water content of a well-drained soil and that present when the crop can extract no more moisture from the land (the so-called "*wilting point*") is a measure of the available moisture for the particular soil. This is demonstrated by the following figures:—

	Maximum Field Capacity. Per cent.	At Wilting Point. Per cent.	Amount Available. Per cent.
Red volcanic loam..	30	20	10
Red forest loam ..	24	12	12

From these figures it is seen that a soil may still be holding a large amount of moisture, but it is not available for plant growth. The red volcanic soil has the higher water holding capacity, but cane on this soil type will cease growth before that on the red forest.

Growth measurements on canes grown on the red volcanic soil have shown that the crop receives a definite check in growth ten days after a liberal fall of rain, when conditions were otherwise favourable for growth; so that heavy irrigations at ten day intervals, or shorter periods, would be necessary on this type of soil if crop growth is to be maintained continuously under summer conditions.

Although the moisture available for growth may be 10 per cent. of the weight of soil, other factors, such as evaporation from the soil surface, contribute to further losses. Windy conditions during the hot months of the year have a very distressing effect on crops under unirrigated conditions, as they increase evaporation both from the plant and the soil.

The results which have been obtained from red volcanic lands under irrigated conditions, speak for themselves. Growth measurements carried out on this type of soil adequately fertilized and irrigated have shown stalk elongations of 7 inches and more per week during the hot summer months, when the mean temperature of the air has been over 75 deg. The forest soils, which constitute the larger part of the irrigated area, may, and do, produce heavy crops of cane under irrigation as will be shown later.

P.O.J. 2878, the "Wonder Cane" of the southern areas, is a most suitable irrigation cane, and some excellent crops results are obtained with it when adequately fertilized, both as standover and 12 months crops. On irrigated farms, it appears general that 65-70 ton yields per acre may be produced economically in two years.

P.O.J. 2725 is another excellent irrigation cane for the south, although apparently few farmers have so far given this cane a worthy trial. On the Experiment Station under irrigation conditions it outyielded P.O.J. 2878 both on frosted and non-frosted plots by 12·5 tons per acre. Admittedly the cane arrows, and would in that case not be suitable for standover; but that is no reason why it should not be grown as a March plant, and 12 months ratoon cane, as excellent results have been obtained with this variety under these conditions on the red forest soils. As examples of the results which are obtained with P.O.J. 2725, the following figures are presented:—

Season.	Class of Cane.	Age when Cut.	Yield per Acre.	C.C.S. in Cane.
		Months.	Tons.	%
1937	March plant	18	75	14·7
1938	First ratoon	12	42	14·4
1938	February plant	20	82	14·4

All crops were fertilized at the rate of 7 cwt. per acre, of which 4 cwt. was sulphate of ammonia.

One distinct advantage which P.O.J. 2725 has over P.O.J. 2878 is its better resistance to downy mildew. This is a matter of considerable importance in the Bundaberg area at the present time.

While good results are obtained from the use of fertilizer in the south, provided rain falls, under irrigation it is absolutely necessary if heavy crops are to be harvested, and the fertility of the soil is to be maintained. One point which should be borne clearly in mind by farmers irrigating is that they should apply heavier applications than are used in general farm practice, especially in the case of sulphate of ammonia, which will provide big crop increases under irrigation conditions.

The Isis, a district of red volcanic soil with forest soil on the fringes, is an area which is virtually entirely dependent on rainfall to produce a crop. There are very few irrigation plants in the Isis, but the farmers who are fortunate to have them are to be commended on their enterprise in attempting to place their crops beyond the range of climatic conditions. One plant in particular in this area, belonging to

Mr. M. Brand, Cordalba, is worthy of special mention because of the difficulties which have had to be overcome to get the water to the farm. The supply is obtained from a site on Woco Creek, and the plant consists of a 57 B.H.P. crude oil engine driving a 4-inch, 4-stage centrifugal pump, the capacity of which is slightly over 20,000 gallons per hour. This large engine is necessary as the water is pumped through $1\frac{1}{2}$ miles of 6-inch pipe line, traversing undulating country; it includes the crossing of several gullies and one creek, over which a framework had to be erected to carry the pipeline. The water is delivered into a dam at the highest point of the farm, and can also be taken off at various points along the pipeline. Sixteen hours of direct pumping on to the field from these points is the general practice; during the remaining eight hours the water is discharged into the dam which has a capacity of 250,000 gallons.

Plate 94.
SHOWING THE HOLE IN WOCO CREEK FROM WHICH IRRIGATION WATER IS PUMPED BY MR. M. BRAND.

The plant on this property is not being used to produce record crops on a small area, but to prevent the check in growth of a large area, the watered section showing a definite benefit from these applications. A comparison, which illustrates the value of water, is afforded by a 25 months old standover second ratoon crop of P.O.J. 2878, watered once, which produced 34·5 tons per acre as against 23 tons per acre from similar unwatered cane, with the c.c.s. in favour of the former.

During the 1938 season a 12 months plant crop of P.O.J. 2878 harvested 50·8 tons per acre with c.c.s. of 14·8, and 12 months first ratoon P.O.J. 2878 gave 45·6 tons per acre at 15·5 c.c.s. Although weather conditions for the past 18 months of the plant's operation have been the best experienced for some years, the increase from irrigation is definitely apparent.

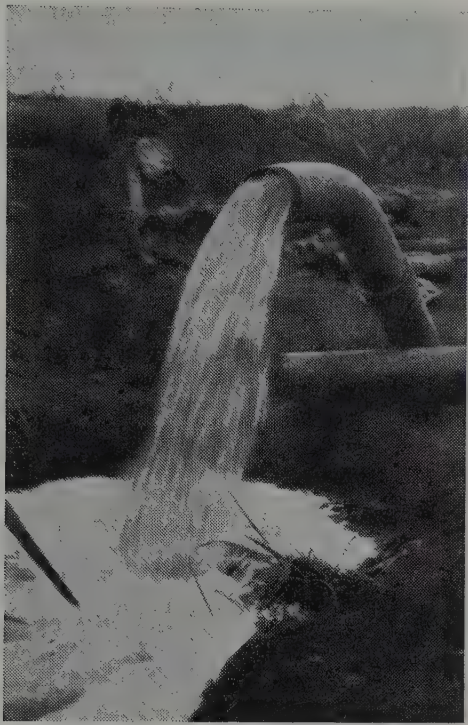


Plate 95.
Showing the Supply from the 4-inch 4-stage Pump Discharging into the Storage Dam Located on the Highest Ridge of the Farm.

Now that definite production limits have been placed on the sugar industry, with the probability of farm peaks, intensive cultivation of cane on reduced acreages, and a long range agricultural rotation suggest themselves as a natural and logical consequence. It is here that the farmer with irrigation can control his production irrespective of seasonal conditions; he may devote portion of his land to alternative crops, or at least give his blocks, in turn, a rest under long fallow, aided by leguminous cover crops.

BOUNTIFUL SEASONS FOLLOW A DROUGHT.

The record of past seasons confirms the opinion of farmers and graziers—an opinion that is widely held—that after the land has been subjected to a period of compulsory rest by drought, nature makes up for this harsh treatment by providing bountiful harvests in following years. In Southern wheat areas, this experience is fairly general and is borne out by production figures in the years of plenty.

To the farmer, the soil is working capital and nature, in spite of her capriciousness, provides elements of incalculable value—air, sunshine, and moisture—generously and free to all. The extent of the producer's profit on the year's work depends on how wisely the farmer uses those indispensable additions to his working capital, especially if his efforts are to survive nature's test—the survival of the fittest—when lean years come round again.

A Disc-sharpening Outfit.*

D. L. McBRYDE.

ORDINARILY, the sharpening of plow discs is a job for skilled labour, and for this reason, the vast majority of farmers have to send their dull discs away to their local blacksmith or mechanic, when they are no longer sharp enough to give reasonably good work. In fact, because of the trouble, delay, and expense discs are kept in operation much longer than is good for the quality of the plowing, and standards of cultivation fall away as a consequence.

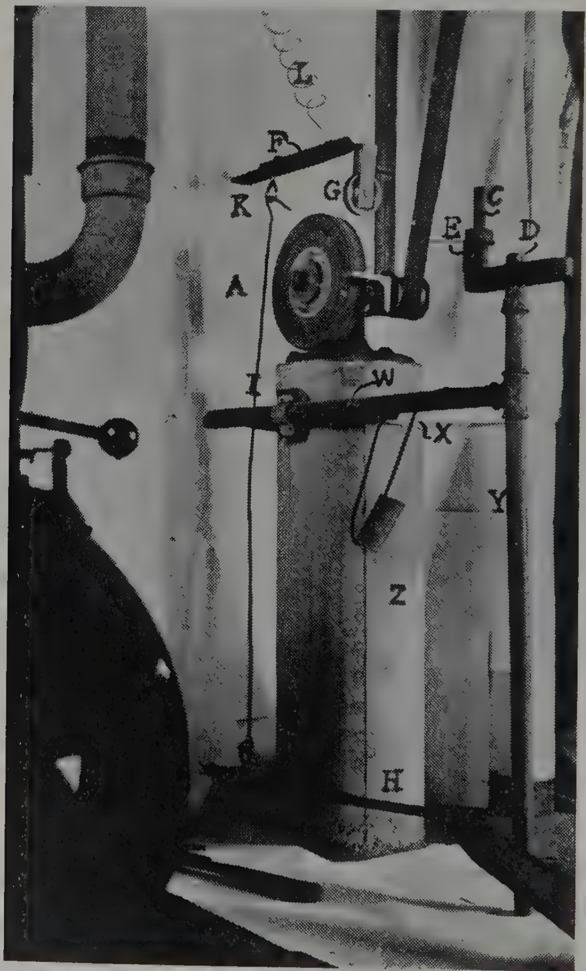


Plate 96.
ILLUSTRATING THE DISC-GRINDING FITTING, SHOWING THE COMPLETE ASSEMBLY.

Some years ago, the writer devised a layout whereby disc sharpening became a simple operation, and, provided certain precautions were

* From *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), July, 1939.

taken by the operator, there was not any damage done through loss of temper of the sharpened discs. This apparatus could be installed easily and cheaply by any practical farmer, to be driven by his stable engine.

The efficiency of the layout is dependent upon three main points:—

Firstly, a disc pivot-pin which is readily adjustable to suit the particular diameter of the disc to be ground; *secondly,* the pivot-pin should also be readily adjustable so that the disc height may be made to suit the disc being ground; and *thirdly,* an easy method of applying pressure of the disc upon the stone to suit the nature of the work being done.

The accompanying photographs (Plates 96 and 97) illustrate the apparatus erected at the Mackay Experiment Station, and plans (Plates 98-101) show the details of the manner in which various parts of the apparatus are built into the assembly. In the plans the parts are as follows:—

A Emery wheel.
B Plow disc (in position for grinding).
C Pivot-pin (shown in detail in Plate 98).
D Pivot-pin adjusting bolt and nut.
E Height-adjusting rings or washers.
F Upper pressure regulating arm.
G Pressure regulating wheel.
H Lower pressure regulating arm, or pedal.
I Rod connecting pressure arms *F* and *H*.
K Hinges of arms *F* and *H*.
L Recoil spring, lifting arm *F*.
M Wall stud or post.

The emery-stone at the station is placed in a position where the disc-grinding fitting would be in the road of traffic if it were to be permanently fixed in the position shown in the illustrations. So that it may be moved out of the way when not in use the pivot-pin is mounted on a frame of 1 inch water pipe, and this frame is clamped to the foundation column of the stone. When not in use, the frame (*Y*, Plates 96 and 97) is released by slackening the long-threaded bolt on strap *X* when it may be swung away to a position at right angles to that illustrated, against the shed wall.

Where the fittings would be an obstruction, the pivot-pin could best be attached to the top of a post sunk in the ground in front of the stone, and the pressure regulating arms (*F* and *H*) could easily be hinged to another post at the back of the stone.

The recoil spring should be powerful enough to pull the pressure arms up several inches from the working position, but not so strong that undue weight is needed on the pedal *H* to bring the pressure wheel *G* into operation while grinding discs.

To set up a disc for grinding, first slacken the pivot-pin bolt *D*. Place the disc on the pin, and move the pin towards or from the stone until the rim of the stone is against the rim of the disc, and their positions show that the resulting bevel edge would be as required. If any

difficulty is experienced in getting a correct bevel, adjust the height of the disc upon the pivot-pin by taking off, or putting on, one or more rings, or washers, *E*. Thus, by varying radius and/or height adjustments, the angle at which the disc makes contact with the stone may be varied to give a wide range of bevelling to the sharpened edge, and a bevel to suit the work to which the disc will be put may be had. Later, some remarks on bevels for special jobs will be made.

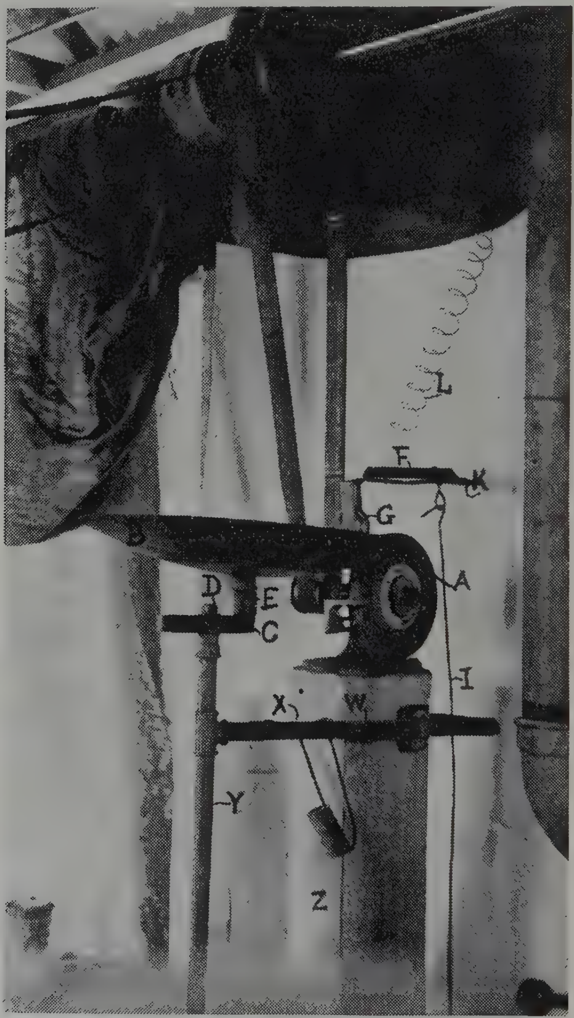


Plate 97.

SHOWING THE DISC-GRINDING FITTING, WITH THE DISC IN POSITION FOR SHARPENING.

When setting up a disc for grinding, it must be remembered that the disc falls towards the stone as the shoulder is ground away. Also, the friction of the stone tends to push the disc away from the stone. These two points should be allowed for when adjusting height and radius. The pivot-pin holding-down bolt *D* should be tightened before

commencing to grind. After these adjustments have been made the stone may be set in motion, but for the preliminary setting-up the stone should be idle.

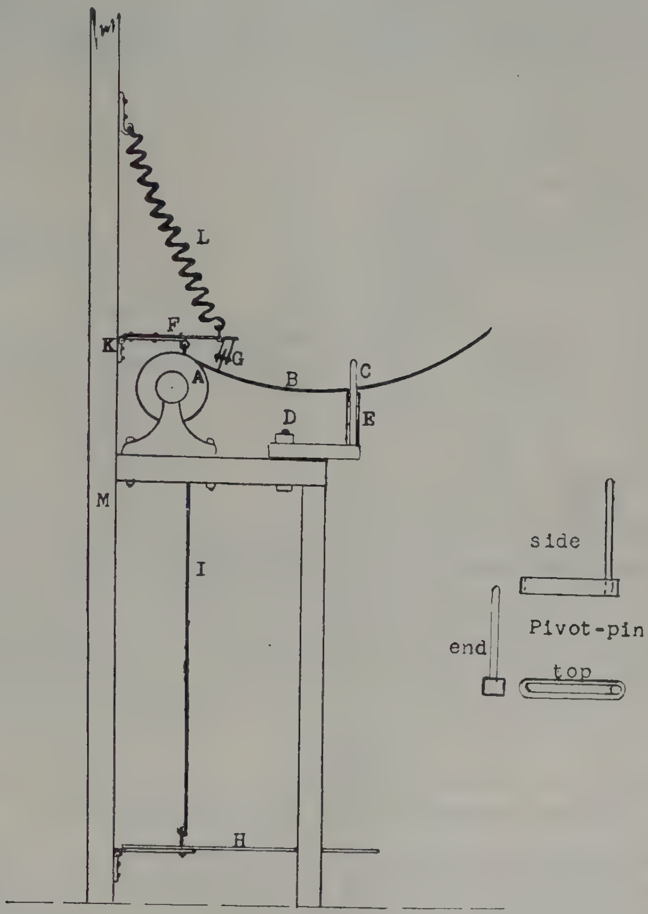


Plate 98.

Drawing showing the Essential Features of the Set-up.

The operator, who should wear a strong pair of gardening gloves for protection of his hands, holds the disc edge in both hands and imparts a continuously revolving motion to the disc, and at the same time presses on the pedal with one foot, thus causing the disc to be pressed against the stone. It is very important to keep a constant movement of the disc, more especially as the grinding is nearing a finish and the edge of the disc gets thin. If the disc remains stationary for even a second or two, hot spots will be formed on the edge, and the temper of the metal will thus be spoiled. After a few revolutions of the disc, it is advisable to examine the angle of the cut and see that it is as desired.

When grinding very dull discs heavier pressure may be placed on the disc, but the entire rim of the disc will soon become heated to an extent which causes discomfort to the hands. In such cases, grinding

should be stopped before serious heating occurs, and the disc should be allowed to cool, or be cooled by pouring water along its edge. In cases of badly worn discs it is necessary to readjust the pivot-pin, by bringing it closer to the stone, when grinding is partly completed, and this may be done while a stop is made to cool the disc. Light grinding pressure is recommended when nearing the finish of a disc.

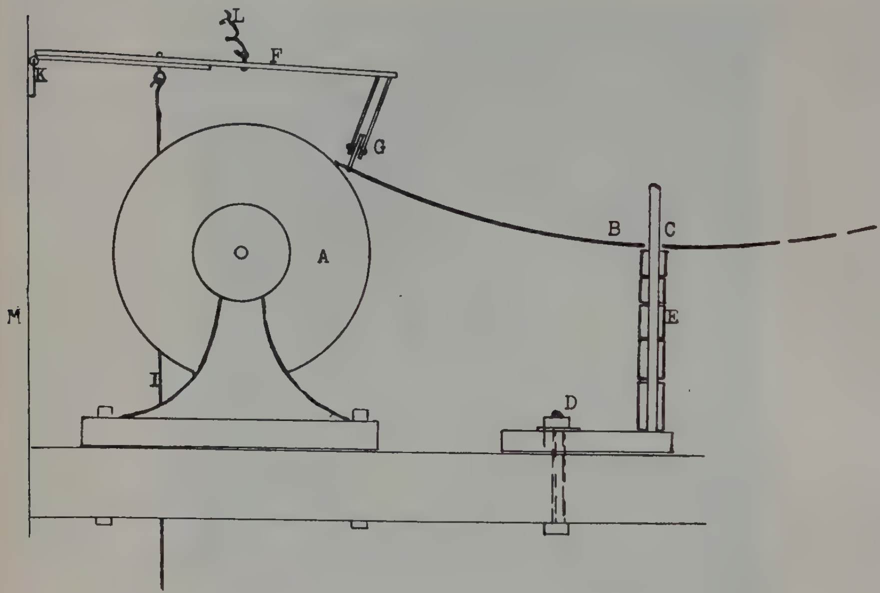


Plate 99.

ILLUSTRATING THE MANNER IN WHICH THE DISC IS ADJUSTED TO GIVE THE CORRECT ANGLE OF CONTACT WITH THE EMERY WHEEL.

Some discs are of metal which forms a "wire-edge"; that is, the edge does not grind cleanly, but forms a thin filament which turns inwards, away from the stone. When this occurs, it is best to cease grinding when almost finished, and then rub the disc with a fine file, placing the file flatly on the inner face of the disc whilst filing. When the wire-edge has been removed, grinding may be completed.

Discs which have been badly neglected or are very badly worn, will generally develop a shoulder on each side of the disc. A definite shoulder on the inner face is a serious fault, and should be corrected by hammering. The disc should be ground until the outer shoulder is removed completely. Place the disc on an anvil, or solid block, as shown in Plate 100, so that the extreme edge of the newly-ground face touches the anvil, but with the inner edge slightly off the anvil. Hammer the disc at a slight distance back from the edge (at *X* in Plate 100) and keep turning the disc while hammering. If there is a serious error to correct it is better to make several revolutions of the disc, hammering out a little more at each turn, than to hammer heavily with the object of taking out the entire shoulder in one turn. In fact, to attempt to take out a bad shoulder by hammering heavily may cause the edge of a

hard disc to chip or crack, more especially if done during cool weather when the disc is cold. Under cold conditions it is recommended that the disc be warmed up to a temperature which is uncomfortable to the touch, but which does not burn the skin, before hammering is done. A better and quicker job will thus be effected, and there will be no risk of damage to the disc. Dents in the rim of a disc should be hammered out before sharpening.

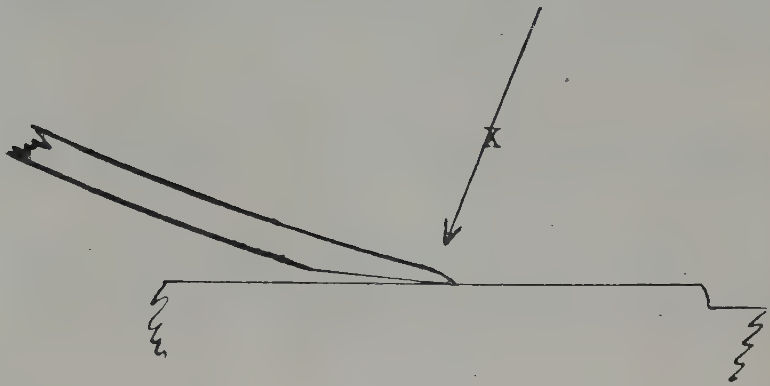


Plate 100.
Showing the Method Employed for Beating Out the Disc Shoulder on an Anvil.

As regards bevels, it may be stated that the best bevel is a long, narrow one, but while this is true in theory, it is often preferable to sacrifice something of the sharpness to obtain an edge which will last a longer period before requiring to be re-sharpened. In practice it is recommended that a wider or coarser bevel be made whenever the disc is to go into hard soil, and a really fine bevel be made for soft work only, and where the soil is free of stone.

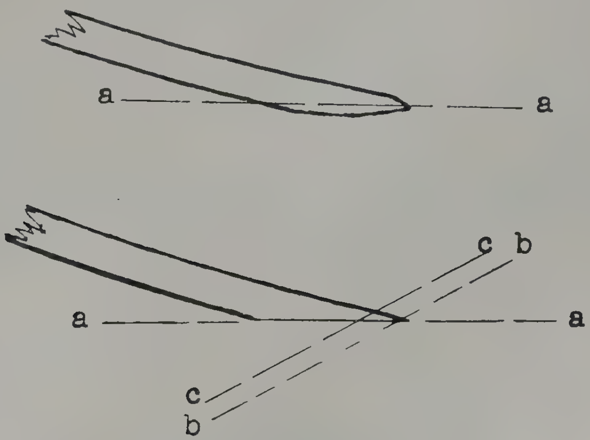


Plate 101.
Illustrating a Suitable Bevel for the Sharpened Disc, and the Method of Resharpening as the Edge becomes Worn.

Plate 101 depicts the section of a disc on which the edge has been worn, and line *a—a* represents what might be thought a satisfactory

bevel for the finished, sharpened edge. Such an edge would be satisfactory under soft soil conditions, and if the soil were free of stones. For hard working conditions, it is suggested that a final grinding be given after bevel *a—a* has been made. If a very light grinding is done to give a bevel as shown by the line *b—b* this will result in a keen, and much more lasting edge than the finer one. After some wear, another light grinding at say *c—c*, parallel to *b—b*, will re-sharpen the disc with only slight loss of metal, but the time will come when a shoulder of serious proportions will again develop, and further heavy sharpenings on the bevel *a—a* will be required.

The time taken to keep a disc in good condition is not very great, and will more than repay the grower by giving an improved standard of work from his plow. Also, a keen disc does not require the power for plowing at a given depth, and does not compact soil below the plowed depth, as does a dull disc.

The cost of an emery-stone, with single mounting, is about £3. With a light belt and a few fittings which are required to put in an outfit along the above lines, £4 should cover everything, and any grower who is handy will have little trouble in erecting it.

CRANKCASE OIL—ITS USE AND ABUSE.

Most people dislike to see the oil drained from the tractor and auto crank case go to waste, as it accumulates rapidly when the tractor is being used during the busy season. The first thought is to use it on other machinery having less delicate mechanism, and proceed to use it on the binder, mower, manure spreader, or thresher, This practice is distinctly dangerous.

Oil drawn from an engine crank case contains a certain amount of fuel which has not burned and has found its way past the piston into the crank case and the oil. This is especially true of the less volatile oils. Only a small percentage of fuel mixed with the oil will greatly lower its lubricating qualities.

Dust, carbon, and other foreign matter find their way into the crank case, gradually building up a grinding mixture. The drained-out oil, with its lowered viscosity and grit, combined with useless particles of oil broken down by use and heat, has generally passed its usefulness in lubrication by the time it is drained.

The reasons for not using this oil to lubricate other machinery can be summed up under three main objections. First, the oil has been thinned down and may not have the lubricating qualities necessary to prevent injury to the bearing on which it is used; second, it contains solid impurities which act as an abrasive and cause undue wear on the bearing; and, third, the fine particles of foreign matter will ultimately close up the oil holes and cut off the supply of oil to vital parts. A few shillings put in the bank by the use of this oil will nearly always come home to roost in the shape of expensive repair and service bills.

The drained oil can profitably be used, however, for a number of purposes, including—

As an anti-rust coating for the protection of metal exposed to the weather.

As a preservative for wood.

As a dust-layer—lightly sprinkled over the ground.

As an insecticide for spraying pig pens, fowlhouses, and similar structures, and by use in automatic oilers.

As a grass destroyer in places where weeds or grass are not desired.

As a rust preventive for chains, sprockets, and other parts when machinery is stored after harvest.

Fibre in Cane.*

H. W. KERR.

THE price received by the canegrower for a ton of cane is inevitably governed by the quantity of sugar which it contains. Where the grower is paid directly on analysis this is determined by the mill chemist when the cane is delivered for crushing. Actually, it is the *cane juice* which is analysed, and the quantity of such juice in the cane is then calculated in accordance with the amount of fibre in the particular consignment.

The manner in which the last-named adjustment is made has probably been responsible for more contentious discussion than any other question which mutually affects grower and miller. *Firstly,* the method of selection and preparation of sample sticks for the fibre test has given rise to much contention. This has been very extensively investigated, and it may confidently be stated that the technique at present laid down by the regulations under the Sugar Cane Prices Acts, does assure that the fibre percentage as determined is as accurate as can reasonably be expected, when the sampling difficulties involved are appreciated. *Secondly,* it is recognised that, for a given variety, there exists normally a variation in fibre content between plant, ratoon and standover crops. It is therefore customary for the mill to determine periodical (usually weekly) fibre values for each class of each major cane variety, and to apply these average figures to the respective consignments of cane falling within each class. The farmer supplying a crop of well-grown cane will protest against the application of an average fibre figure which must certainly be inflated by the inclusion of cane from other lands which has been produced under adverse conditions, and he often claims that he is entitled to a fibre figure determined for his special parcel of cane. *Finally,* a wide variation occurs in the care with which growers prepare their cane for milling purposes. While some pay special attention to the topping of the stalks, and guard against any soil or trash being loaded on the trucks, other farmers give little heed to this important question. The miller naturally objects to paying cane prices for trash, roots and soil, and claims that these factors should be given due weight in arriving at a true basis of calculating from juice analysis to cane composition. Again, the grower supplying clean cane objects to being penalised for the careless farmer. Doubtless the cane-cutting gang is in a measure directly responsible for the quality of cane as supplied, but it is the farmer's duty to see that all conditions are rigidly observed in this respect.

It should, theoretically at least, not be a difficult matter to appease all parties in such disputes; but in practice, any attempt to meet the wishes of miller and grower in matters of detail would introduce so many complexities, that the cost of carrying the project into effect would probably more than outweigh any of the benefits secured.

With a view to assessing the possibilities of such a plan, a comprehensive series of investigations in fibre determination were commenced some three years ago. The results of these tests have been issued by the Bureau in two technical bulletins—one prepared in 1937, and the other which was published recently. Copies of both bulletins are available to any canegrower wishing to study the technical aspect of the problem, and the conclusions which may be drawn from the results

* From *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), July, 1939.

obtained. For the present, it is proposed to present the major conclusions in a broad manner, so that farmers generally may be acquainted with the present status of the problem.

Results of Investigations.

1. Fibre Variation within the Stick.

The unit taken in preparing a sample of cane for the fibre test is, of course, the stick of cane. The Cane Prices Regulations set out the manner in which stick samples are to be taken, and sub-sampled for analytical purposes. It will be obvious, then, that the precision with which the average fibre content for a given variety and class of cane can be determined will be governed in the first place by the variation *within the stick* of cane. Tests have shown that, early in the season, the fibre is highest in the butt section of the stick, is sensibly uniform throughout the major portion of the length, and is slightly lower than the average in the top portion. As the crop matures, the normal sequence is for the fibre in the top section to rise, so that the butts and tops both give values higher than that for the mid-section.

2. Fibre Variation between Sticks.

When the values of the fibre for individual sticks are compared, it is found that there is a wide variation also from stick to stick, even when drawn from the same field of cane. On a test involving twenty-four sticks of P.O.J. 2878 ratoon cane, for example, the highest test was 13·3 per cent. and the lowest 9·9 per cent. This is characteristic of the variation experienced. In the mill, however, sample sticks are grouped for cane drawn from a *number* of fields. When parallel tests were carried out with cane sticks from different sources, it was found that the difference between extreme tests for individual sticks was even greater. Thus, for sticks of P.O.J. 213 from three fields, the extreme single-stick tests were 17·5 per cent. and 13·4 per cent. respectively.

When it is remembered that all of these tests were made on clean sticks of cane, uniformly topped, it will be realised that the selection of sufficient sticks from all consignments of a variety as usually delivered, to give a true average figure, involves no little trouble and time. Certainly these results bear out the contention that the cane from all farms does not conform with the average fibre figure awarded to them; thus two farmers harvesting P.O.J. 2878 at the same time were delivering crops with 11·9 and 9·8 per cent. average fibre respectively, while a similar comparison for P.O.J. 213 gave values of 16·6 and 14·8 per cent. But, from what has been presented, the magnitude of the sampling and testing job will be appreciated, when it is realised that cane of one variety and class is being delivered daily from perhaps fifty or more farms; how could each expect to receive the true figure based on individual tests? An augmented laboratory staff would be fully engaged in this work alone.

3. Fibre Variation—Plant v. Ratoon v. Standover Cane.

The tests under discussion bore out the normal mill finding that ratoon cane shows, *on the average*, a higher fibre figure than plant cane. This is, of course, not uniformly true for all individual consignments, but is governed chiefly by the condition of the cane in question. Many fields of well-grown ratoon cane showed a lower fibre content than poorly grown plant cane of the same variety.

Standover cane is generally higher in fibre than one-year-old cane, whether plant or ratoon. This is to be expected, as the short "notches" of standover cane are very high in fibre, while age is also a factor contributing to woodiness.

4. Effect of Topping on Fibre Content.

In certain of the tests, sticks were topped "high," so as to show a well-defined "bull's eye." It was found, unexpectedly, that this added section often possessed a lower fibre content than the balance of the stick; in general, however, inclusion of the immature section increased the average fibre. It must be remembered, of course, that this is not a justification of the policy followed by some growers, in the expectation that it will prove profitable. Moreover, the tests here reported were carried out on freshly topped sticks. When such were dried out, as they usually are on arrival at the mill, it would be expected that the fibre would be markedly higher in the immature portion of the cane.

The Problem of Trash and Dirt.

Though it is concluded that the employment of any but average fibre figures in computing cane values would be impracticable, it does appear that something might be done to adjust the figure, according to the freedom or otherwise of the particular consignment from trash and other extraneous matter. That is, instead of attempting to include adhering trash in the material prepared for the fibre test, as is sometimes done, it is suggested that the test be made exclusively on clean cane, and a "correction" added to this figure to allow for the degree of impurities included on the trucks with the cane sticks. This at least would provide a well-merited bonus for the supplier of clean cane, and duly penalise the grower who is not so particular.

For this purpose it would be necessary to classify all cane on appearance, at the time of its discharge on to the carrier. Three classes are proposed—A. "Clean" cane, B. "Medium trashy" cane, and C. "Dirty" cane. The standards of cleanliness would, of course, vary from mill to mill, as would also the corrective factor to be applied.

As an example of the amounts of field trash bought by the miller as cane, the following are the average figures obtained from a large series of cane cleaning tests made at a number of Queensland mills last year:—

	Extraneous Matter. Per cent.
"Clean" cane	1·2
"Medium trashy" cane	2·0
"Dirty" cane	3·4

It is confidently suggested that the adoption of this proposal would result in a speedy improvement in the quality of the cane supply. Moreover, it would remove what has long been a contentious subject between miller and grower, as well as amongst growers themselves.

Efficiency of Germicides and Disinfectants.

F. B. COLEMAN, Registrar of Veterinary Medicines, and R. A. TAYLOR, A.A.C.I., Inspector and Examiner, Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Investigation Branch.

ON the Queensland market—and elsewhere—there are numerous proprietary articles which, it is claimed, are useful for purposes of promoting the health and hygiene of humans or stock; these include disinfectants, germicides, antiseptics, and deodorants.

The lastnamed, as the name implies, are of use only for destroying offensive odours.

Antiseptics are preparations useful for preventing the putrefaction or decomposition of animal or vegetable matter, or preventing the development of bacteria. They may be classed with preservatives used for preventing the decomposition of foodstuffs. They are not necessarily efficient in killing bacteria.

Germicides and disinfectants—the terms are taken here as being synonymous—are preparations which are capable not only of preventing the development of, but also of destroying the germs of disease.

Now, with germicides and disinfectants it is necessary to know how efficient the preparation is in destroying germs or bacteria. There are various methods of comparison. Most germicides and disinfectants contain as the active constituent, phenol or its homologues. The percentage of the active constituent is declared on the labels of these preparations when they are packed for pest destroying or veterinary purposes. This provides a method of comparison; however, the phenol or homologues—tar acids—may vary in quality or differ in the proportions of the homologues present—phenol, cresols, and in some cases xylenol and other higher boiling point homologues. The bactericidal efficiency of these phenols varies. Further, certain properties of the preparations, such at wetting power, also affect the efficiency.

Then there are preparations which contain active constituents other than phenols—such as various essential oils and synthetic organic bactericides.

A method of comparison of bactericidal efficiency based on the proportion and type of active constituent present is thus unsatisfactory.

A method has been evolved, however, which does away with the necessity of comparing the constituents and properties of the preparations, and relies on an actual practical evaluation of the killing power on certain bacteria under set conditions.

This is the Rideal-Walker test, and the value obtained from such test is called the Rideal-Walker co-efficient.

It relates only to the value of the preparation on dilution with water. It can only apply, therefore, to water soluble or water-miscible preparations; the Rideal-Walker co-efficient of oils is obtained by using an emulsifying agent, to enable dilution with water to be effected—with proprietary preparations, however, water solubility or miscibility is a necessary feature.

In actual application, the co-efficient is used only with liquid germicides or disinfectants.

In carrying out the test the method laid down by the British Standards Institution is followed. A special culture of typhoid bacteria (*Bacillus typhosus*) obtained from the Lister Institute is used, and 1 per cent. carbolic acid (phenol) is taken as the standard of comparison against the germicide or disinfectant being tested. A standard broth is used as a medium. The actual result obtained is the rate of dilution in hundreds, at which the germicide will effect the same kill as 100 per cent. carbolic acid diluted with water 1 in 100, in the same time.

The time which the diluted (1 in 100) carbolic acid takes to effect a kill averages five minutes.

A germicide which, at a dilution of 1 in 300, would effect a kill in the same time as the standard diluted carbolic acid would be given a Rideal-Walker co-efficient of three. A germicide killing at a dilution of 1 in 1,800 would be given a co-efficient of eighteen.

As the co-efficient is a comparative value, a variation in the time taken by the standard solution (as occurs) does not affect the accuracy of the figure.

Different workers in different laboratories, although obtaining times varying from 2½ to 7½ minutes, agree fairly accurately on the co-efficient obtained for similar preparations tested.

It should be understood, however, that the Rideal-Walker co-efficient merely indicates the value of the preparation as compared with standard carbolic acid under test conditions, against a specific bacteria; it does not necessarily indicate the value under all conditions and against all bacteria.

Nevertheless, for disinfectants and germicides for general purposes, it is a very useful figure, and a knowledge of the principles involved in the method used for its determination should lead to its more widespread use both by manufacturers and purchasers of preparations concerned.

The following table sets out details relating to the liquid germicides, disinfectants, and antiseptics registered under the Queensland Veterinary Medicines Acts for the current period as at 30th June, 1939:—

LIQUID GERMICIDES, DISINFECTANTS, AND ANTISEPTICS.

Registered under the "Veterinary Medicines Acts" for the period, January, 1939, to December, 1941.

List Published: 30th June, 1939.

Name of Preparation.	Rideal-Walker Co-eff.	Active Constituents. (As declared on label.)	Name and Address of Primary Dealer.
Germicides and/or Disinfectants—			
Acco Savol	3·5	10 per cent. High B.P. Phenols and Cresols	The Australian Chemical Co. Ltd., South Brisbane
C. N. Disinfectant	6·5	25 per cent. Cresols	Norris Agencies Pty. Ltd., Brisbane
Cresola No. 1	7	20 per cent. Tar Acids	United Chemical Co. Pty. Ltd., South Brisbane
Cylol	1	5 per cent. Cresols	J. H. Eden and Co., Brisbane
Germacol	1	5 per cent. Meta-Cresols	United Chemical Co. Pty. Ltd., South Brisbane
Globe Disinfectant	..	30 per cent. Phenols	W. Lovelock and Co. Pty. Ltd., Brisbane
Harton Veto-cide	0·2	7 per cent. Cresylic Acid	Goldsborough Mort and Co. Pty. Ltd., Brisbane
Havcol	0·58	5 per cent. Phenols and Cresols	Hayes Veterinary Company, Brisbane
Kerol	18	46 per cent. Phenol Homologues	Dalgety and Co. Ltd., Brisbane
Mactaggarts Carbol	1	5 per cent. High B. P. Cresols	Mactaggarts P.P. Co-op. Assn. Ltd., Brisbane
Moase's Famous Antiseptic Disinfectant Deodorant	18	20 per cent. Phenols	W. E. Moase, Wynnum
Osmonds Zenos Fluid Disinfectant	4	18 per cent. Phenols	Flynn Bros., Brisbane
Pegasol	0·6	10 per cent. Higher Phenols	Bryce Ltd., Brisbane
Safonia	0·2	5 per cent. Cresylic Acid	Australian Disinfectant Co., Brisbane
Sapocarb	3	50 per cent. Cresylic Acid	Surgical Supplies Ltd., Brisbane
Sidolia	1·9	10 per cent. Cresols	Norris Agencies Pty. Ltd., Brisbane
Antiseptics—			
Carbox	..	7 per cent. Cresols	Henry Berry and Co. Pty. Ltd., Brisbane
Judge's Vettoll	..	4·6 per cent. Carbolic Acid	D. Maclean and Co., Brisbane
Nobles Vettoll	..	4·6 per cent. Carbolic Acid	W. A. Noble and Sinnamon, Toowoomba
Safa	..	4 per cent. Cresols	Campbell Bros. Pty. Ltd., Brisbane

The Value of the Cotton-Grassland Rotation.

RESULTS obtained in experiments and by farmers in commercial crops have shown definitely that a cropping programme, in which cotton is grown in rotation with grassland, increases largely the chances of obtaining satisfactory yields of cotton under a wide range of climatic and soil conditions.

What it means in yields.

The yields of cotton produced by means of this rotation vary, of course, according to the soil and the conditions under which the crops are grown. However, gains up to even 100 per cent. can be obtained from cotton planted during the three years following the ploughing of a pasture, as compared with yields from land cropped year in, year out, with cotton for longer periods.

The following table of seed cotton yields illustrates the gains that have been obtained from cotton-grassland rotations on the Biloela Research Station, in the Callide Valley, during the 1938-39 season:—

1. Fertile forest clay loam. Second year of cultivation out of grassland averaged	1,483 lb. per acre.
Fourteenth year of continuous cultivation averaged	1,227 lb. per acre.
Difference =	256 lb. = 20 per cent. gain.
2. Fertile forest loam. Third-year cotton following three years of Rhodes grass preceded by eight years of cotton averaged	1,033 lb. per acre.
Similar land with its fourteenth successive crop of cotton averaged	856 lb. per acre.
Difference =	177 lb. = 20 per cent. gain.

3. Infertile sandy clay in the fourteenth year after the breaking-up of the original grassland.	
Third-year cotton following three years of Rhodes grass preceded by cotton averaged ..	643 lb. per acre.
Similar land continuously cropped with cotton averaged ..	401 lb. per acre.
Difference =	242 lb. = 60 per cent. gain.

The increased cotton yields produced during the first three years after the breaking-up of grassland are due to the suitable balance of the plant foods in the soil for cotton and the ability of the soil to absorb rain sufficient for the needs of the growing crop.

What it does to the soil.

With the growth of successive crops of cotton on the same area for several years, the soil becomes progressively less satisfactory for the production of cotton, except in the best of seasons. The growing of seven successive cotton crops on the same area at the Biloela Research Station impaired the absorptive power of the surface layers of clay loam soils, so much that not more than 35 to 40 per cent. of a storm rain penetrated to a depth of 9 inches into dry soil during the growth of cotton plants in the seventh year.

This amount of moisture provided only temporary benefit for the plants. The repeated ploughing and cultivation of the soil during the seven-year period also stimulated bacterial activity to such an extent that, in the latter years, the rate of nitrification provided an excessive supply of nitrate nitrogen for the cotton plants in the early part of the mid-summer wet season. Under such conditions, the cotton plants tend to make an undesirably rank growth if wet weather is experienced at mid-season, especially if late sowings have been made on fertile soils.

The Rhodes grass in the cotton-grassland rotation reduces the supplies of nitrate nitrogen in the soil to a very low level, which permits the growing of at least three good crops of cotton following the breaking-up of the Rhodes grass sod. This is not the only benefit, for the incorporation of the Rhodes grass stubble in the soil by the ploughing operations improves appreciably the permeability of the surface layers of the soil, which allows of a greater penetration of rainfall. Both effects favour the production of better yields of cotton than are obtained on old cultivations.

How it helps the dairy farmer.

The cotton-Rhodes grass rotation is particularly suitable for the farmer who combines cotton-growing with dairying. The quantity and quality of the Rhodes grass that is produced in the rotation is superior to the production obtained in adjacent old-established areas of Rhodes grass.

Yields of up to 3½ tons of air-dried Rhodes grass hay have been produced at the Biloela Research Station in the second year of growth of the grass on forest alluvials. The hay is rich in milk-producing

protein, while the grass when grazed is much more palatable to live stock than that on old-established pastures.

How it works on the farm.

It is strongly recommended, therefore, that the rotation should be practised by both cotton-growers and dairy farmers. Old grasslands should be ploughed up and sown to cotton for three successive seasons. Old cotton cultivations should be sown to Rhodes grass for preferably three seasons and then ploughed for three seasons of cotton. Both the yield of cotton and butter-fat per acre will be appreciably increased. In addition, the texture of the soil will remain capable of absorbing even storm rains, and the loss of the fertile surface soils through water erosion will be greatly reduced.

Where farmers have not grown cotton, full details concerning cotton culture can be obtained from either the district instructor in cotton culture or agriculture or by writing to the Department of Agriculture and Stock, Brisbane.

Grow cotton—it is a profitable crop, and an increasing Australian market requires a greater production of Queensland raw cotton.

Plate 102.

An Illustration of the Benefit of Cotton-Rhodes Grass Rotation.—This area of Rhodes grass on old cotton land yielded 3½ tons of air-dried hay in the second year of establishment.

Fat Lamb Production.

GRATIFYING results have followed the scheme initiated by the Minister for Agriculture and Stock with the object of stimulating the production of fat lambs. Rams of British breeds, comprising Border Leicesters, Southdowns, Dorset Horns, Shropshires, and Romney Marsh, were purchased in the South and distributed to farmers who had cultivation available, or who were prepared to cultivate. In certain cases in which a farmer owned a stud ram of a particular breed, stud ewes were supplied with the idea of fostering the breeding of pure stock. All sheep supplied to farmers are on loan, and remain the property of the Department. The progeny and wool, however, become the property of the farmers concerned.

The greatest drawback to the production of fat lambs on the Darling Downs in quantity has been, and still is, the difficulty of purchasing good crossbred ewes as the mother flock.

If a start has to be made with merinos, the best ewe for fat lamb raising is bred by the introduction of one of the long wools, such as Border Leicester, Lincoln, or Romney Marsh, into the strong-woolled, robust type of merino ewe. The ewe lambs of this drop should then be retained as the future dams of the lamb-raising flock.

As to suitable ewes for the fat-lamb industry, it is believed that graziers on the fringe of the Darling Downs or further out would find it profitable to join long-woolled rams of British breed with their cast-for-age ewes with the idea of selling the progeny annually as fat lamb ewes on the Downs. Into the crossbred ewe flock, as described, should be introduced a ram of the Downs type. Opinions necessarily differ in the matter of crosses. The Southdown is the fashionable lamb at the present time, but it should be remembered that this cross must suffer no check from birth to block. The Dorset Horn gives a very nice lamb, early-maturing and hardy. The use of the Border Leicester should be encouraged in every way. In addition to producing an early-maturing lamb that fills every want, it must be remembered that the skin value of this lamb is worthy of consideration to a far greater extent than either the Dorset or the Southdown.

Purebred Corriedale ewes are hard to come by, but should the opportunity occur a farmer would be well advised not to let it slip. Pure Corriedales are hard to beat, good mothers and heavy milkers, besides growing a profitable fleece.

Generally, the wool from a flock retained for fat lamb breeding is a secondary consideration when compared with the production of fat lambs.

WORMS IN SHEEP.

In recent times, the problem of control of the parasitic worms in sheep has claimed attention in different parts of the world, more especially in South Africa, Great Britain, and Australia. Previously, drug treatment was successful only in the case of the stomach worm. Worms inhabiting the small intestine—e.g., the hair worms—and the large bowel—e.g., the nodule worm—were practically unaffected by drugs given in the ordinary way through the mouth. This was due to the fact that, under the conditions usually accompanying treatment, the drug passed into the first stomach or paunch and thus became diluted to such a degree that, by the time it passed through the three remaining stomachs of the sheep, it reached the small intestine in too weak a concentration to be in any way effective against the worms situated there or lower down in the gut.

The process of swallowing in sheep is governed by a groove which passes from the gullet along the roof of the first and second stomachs and eventually into the fourth stomach, which then leads directly into the small intestine. When the sheep grazes, the food is passed directly into the paunch, to be later brought back into the mouth, chewed as a cud, and then swallowed again. This time, however, the groove closes and the thoroughly masticated food goes direct to the third stomach or bible and then is passed on with little delay into the fourth stomach. When the sheep drinks, the groove is again closed, and the water passes almost directly into the fourth stomach. It was therefore considered that if some way could be found of getting this groove to close during treatment, the drug would pass directly into the fourth stomach, and would reach the worms in the small intestine and large bowel in a sufficiently high concentration to kill most of them.

After a large number of experiments, copper sulphate was found to produce this effect. Various strengths from 1 per cent. to 10 per cent. were tried, and it was found that a very small quantity of a 5 to 10 per cent. solution gave very consistent results. This work was carried out simultaneously in Australia and South Africa. For the small hair worms, nicotine sulphate was then combined with the copper sulphate, with very excellent results. This drench was found to be effective against both stomach worms and tape worms. Another point which was brought out by this was that starvation before drenching was not desirable. It was previously considered that by a starvation period prior to drenching, the locality in which the worms were present would be rendered free of ingested food and better contact of the drug with the worms would be given. It was subsequently found that this was more likely to be achieved without starvation, for with starvation the animals brought up the food from the first stomach, ruminated it, and then swallowed it, thus surrounding the worms in the third and fourth stomachs and in the small intestine with the ingested material. Details of this treatment may be obtained on application to the Animal Health Station.

UNIFORMITY IN FAT LAMBS.

From the point of view of the export lamb raiser, uniformity is of very great importance.

There is a growing tendency in Queensland to use too many breeds. With all the other States sending lambs overseas, we share the disability of a lack of the right type of ewe from which to produce the true sucker lamb. This may be overcome to some extent by saving the ewe portion of a drop got by the long wools. With these as the future mothers in a fat lamb raising flock, and joined with the Southdown or Dorset Horn, a good deal of the irregularity of carcase shape would disappear. Add to this the use of the better class rams and we would go far to correct a fault which is admitted, and which proves costly in some cases to individual growers and to the reputation of the State as a producer of export sucker lambs.

MERINO TYPES FOR COUNTRY.

One frequently hears amongst sheepmen the old argument as to the best type of merino wool to breed. The advocate of the fine wools is usually most emphatic, likewise those who hold a brief for the strong and medium. As a matter of fact, there is a useful place for all three types, but it is a fatal error to try to breed a type on country unsuited to it. Thus in the far west, north-west, and central areas, where sheep have certain hardships to withstand, and there are periodical droughts, the fine-woolled merino is not considered suitable. Remembering that to a very large extent constitution goes with strength of fibre, a strong-woolled merino does best in those regions.

Nearer in, in the south-west and Maranoa districts particularly, a strict medium may be found most profitable, but it should be recollected that, to maintain this medium, rams slightly stronger than the desired type should be used. On the Darling Downs, Stanthorpe, and Border areas a fine wool may be grown with profit. Thus fine, medium, and strong all have their uses and habitats.

SHEEP LAND FOR SELECTION AT LONGREACH.

A resumption from Maneroo has been surveyed as portion 5, parish of Millgetta, and will be opened for Grazing Homestead Selection at the Land Office, Longreach, on Thursday, the 7th September, 1939. The portion, which has an area of 29,700 acres, is situated about 40 miles west from Longreach, and the term of the lease will be twenty-eight years at an annual rental of 2½d. per acre for the first period of seven years.

A condition will be that the selection must be stocked to its reasonable carrying capacity with the applicant's own sheep within the first three years.

The portion, which is good woolgrowing and fattening and fairly good breeding country, is watered by several waterholes, and an earth tank of about 17,500 cubic yards capacity.

The country consists mainly of nice open pebbly downs, fairly well shaded and grassed principally with Mitchell, Flinders, and button grasses. There is an area of lancewood and yapunyah along the south-western boundary of the portion.

Free lithographs and full particulars may be obtained from the Lands Department, Brisbane, the Land Agent at Longreach, and the Queensland Government Tourist Bureaux at Sydney and Melbourne.

Washing of Dairy Utensils.

THE general principles underlying the proper cleaning of all metal milk utensils are very simple, and once understood they can be adapted to the requirements of individual vessels and apparatus used in dairying. For this purpose it is essential to understand something of the nature and composition of milk and its products. Milk is a complex substance consisting of water, butterfat, lactose, or milk sugar, casein, albumin, and mineral salts. Cream contains the same constituents in different proportions, so that the problem of cleaning is confined to finding effective methods for the complete removal of fats, sugar, proteins, and salts.

The sugar and mineral salts, being mainly in solution, are almost entirely rinsed away in cold water, which will also remove a large part of the fat and proteins. Butterfat, however, occurs in the form of minute globules, and some of these adhere to the surface of milk vessels and require heat and emulsification before they can be washed off. Of the proteins, casein is in suspension in fresh milk (giving milk its white appearance), but it can be coagulated by acid or by rennet to form a solid curd, the hardness of which is increased by heating; albumin is in solution, but, like egg-white, it is readily and permanently solidified by the action of heat. Both these milk proteins possess considerable adhesive properties (casein is used commercially in the manufacture of paints and glues) and they will, *if the preliminary cold-water rinsing is omitted,* stick firmly to dairy utensils, where hot water washing and subsequent sterilisation will only harden them on to the surface. Once fixed there, even in a very thin film, they form a protective layer where bacteria become lodged and breed, and where the sterilising heat cannot reach them, to the detriment of milk and cream quality. Similar protection is afforded by a layer of fat in the form of grease, which can be tested for by passing a finger over the surface of dairy equipment, and which is caused by using insufficient hot water, water at too low a temperature, or the lack of some soap or soda compound to free the fat.

There are, then, three stages necessary to the thorough cleaning of dairy utensils, as distinct from the sterilising, which must follow in

order to destroy the harmful bacteria. These three stages are as follows:—

(1) *Cold Water Rinsing.*—Utensils should be well-rinsed as soon as possible after use. This is very important, for milk once allowed to dry is much harder to remove completely. Soaking in cold water for a reasonable time is advisable if washing is not to be done immediately—this will loosen all milk solids and facilitate washing.

(2) *Hot Water and Soda.*—Washing soda, caustic soda, soap or soap powder are suitable cleansers for farm use (besides many proprietary preparations sold under trade names). Care should be taken to avoid cleansers containing any gritty substance, for this will permanently damage the surface by scratching, and will rapidly remove tinning. The water should be really hot, and enough soap or soda should be used to emulsify the grease, so that no globules of fat can be seen floating on the surface of the water. A stiff brush should be used on each utensil, and all loose parts, such as taps and strainer discs, should be dismantled for scrubbing.

(3) *Hot Water Rinsing.*—A final rinse, using fresh hot water, is needed to remove the soda water before sterilising.

Milk utensils, if not properly cleaned and sterilised, are by far the most fruitful sources of contamination in the course of milking and handling milk and cream, and it should be remembered that both processes are equally essential, for satisfactory and complete sterilisation is not possible without first thoroughly cleansing along the right lines.

FLUSHING THE SEPARATOR.

The test or percentage of fat required in cream should be not less than 38 per cent. during the hot summer months and not less than 34 per cent. during the cooler months of the year. Whatever make of separator is used, during the process of separating satisfactory results can only be obtained when the cream screw is adjusted so that the driven speed of the separator conforms with the corresponding number of revolutions per minute recommended by the maker of the machine.

At the completion of separating, flushing with cold or warm water so as to remove the last of the cream from the patties is an undesirable practice. If the cream bucket is not removed during the process some of the impurities and slime adhering to the bowl may be removed and deposited in the cream. This applies particularly if warm water is used. When separated milk is used for flushing, excessive milk solids are introduced into the cream and these will have a detrimental effect on quality, as well as lowering the fat test. Thus the proceeds of flushing should be fed to the pigs or calves on the farm. The maintenance of cream quality is too important to be impaired by laxity in this respect.

Sweet Potatoes and Arrowroot for Pigs.

WITH the approach of spring, farmers are planning their cropping programmes, and so the time is opportune for considering the value of such root crops as sweet potatoes and arrowroot as pig foods. These two crops are well known to most coastal pig farmers, and can be grown in most places where there is a sufficient rainfall and a long summer season.

Under similar conditions, the yield of pig feed per acre from arrowroot and sweet potatoes is several times that from maize grain. This fact alone makes these crops worthy of consideration, but they also have the advantage of being more or less drought-resistant and are usually freer from pests. In the case of sweet potatoes, some growers claim that they are worth growing for the vines alone. The vines of the sweet potatoes and the stalks and leaves of the arrowroot provide a large quantity of succulent green food.

If it is necessary to harvest and feed these crops by hand, the labour involved is considerable; but both crops can be fed off by pigs, and where the paddocks are made pig-proof, and some temporary fencing is used to partition off a small portion of the crop for the pigs to harvest, excellent results are obtained. If pigs are allowed to run over the whole crop a good deal of waste results. They should, therefore, be confined on an area which they can clean up in about one week.

Arrowroot is frequently boiled before being fed to pigs; but, although the boiling does increase its nutritive value somewhat, it is doubtful whether the increase warrants the labour required to dig, cart, and boil the bulbs, especially when it has been demonstrated that pigs do remarkably well by harvesting the crop for themselves.

Sweet potatoes and arrowroot are not complete foods in themselves, and must be fed in combination with foods rich in protein, such as separated milk or meatmeal. The more extensive use of these two crops, in conjunction with the separated milk at present available, would enable coastal dairy farmers to increase their output of pigs.

A SUBSTITUTE FOR MILK IN PIG-FEEDING.

It is known generally that meatmeal is a good substitute for separated milk in the pig's diet, but unless it is used carefully meatmeal may prove an expensive food.

Meatmeal, which is a by-product of abattoirs and meatworks, is sold under several trade names, and some varieties contain a small percentage of bonemeal. It is a wholesome food, convenient to use, and costs from 9s. to 10s. 6d. per 100-lb. bag, Brisbane, the higher-priced brands containing a higher percentage of protein.

As meatmeal is expensive in comparison with pig foods grown on the farm, it should not be used more freely than is necessary.

Separated milk, which meatmeal replaces, is used according to its availability, pigs sometimes receiving milk as their sole diet, but pigs will thrive on small quantities of milk used in combination with grain and other foods, such as pumpkins and sweet potatoes; the milk supplies a part of the protein necessary to balance the ration. Each pig from weaning until baconer stage and each dry sow should receive a minimum of $\frac{3}{4}$ of a gallon of separated milk daily, and each sow with a litter double that quantity.

When these minimum quantities of separated milk are not available, meatmeal may be substituted, using about $\frac{1}{2}$ lb. of meatmeal to replace each $\frac{3}{4}$ of a gallon of separated milk.

Pigs thrive on a mixture of milk and meatmeal, or meatmeal alone as the protein-rich portion of the diet. The quantities used should not exceed from $\frac{1}{4}$ to $\frac{1}{2}$ lb. daily per pig from weaning to baconer stage, according as to whether good lucerne is available or not; and $\frac{1}{2}$ lb. for each dry sow and 1 lb. daily for each sow with litter.

By feeding a constant quantity of separated milk or meatmeal, and increasing the grain and other foods according to the pig's appetite, the nutritive ratio is widened automatically as the pig grows and satisfies its requirements.

In cases where pigs have access to good, young pasture or green crops, the minimum quantity of separated milk or meatmeal stated above may be reduced by up to 50 per cent., depending on the quality of the green foods.

Meatmeal may be fed dry or mixed with milk or water.

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Adler, **Tinana**	Nevertire	White Leghorns, Australorps, Rhode Island Reds, and Langshans
F. J. Akers, Eight Mile Plains	Elmsdale	White Leghorns and Australorps
E. J. Blake, Rosewood	Sunnyville	White Leghorns, Australorps, White Wyandottes and Rhode Island Reds
R. H. & W. J. Bowles, North Rockhampton	Glenmore Poultry Farm and Hatchery	White Leghorns and Australorps
J. Cameron, Oxley Central	Cameron's	Australorps and White Leghorns
M. H. Campbell, Albany Creek, Aspley	Mahaca Poultry Farm and Hatchery	White Leghorns and Australorps
J. L. Carrick & Son, Manly road, Tingalpa	Craigard	White Leghorns
N. Cooper, Zillmere road, Zillmere	Graceville	White Leghorns
R. B. Corbett, Woombye	Labrena	White Leghorns and Australorps
T. G. Crawford, Stratford	Rho-Isled	Rhode Island Reds
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme	White Leghorns, Australorps, and Rhode Island Reds
Dixon Bros., Wondecla	Dixon Bros.	White Leghorns
Rev. E. Eckert, Head street, Laidley	Laidley	Australorps, White Leghorns, and Langshans
Elks & Sudlow, Beerwah	Woodlands	Australorps and White Leghorns
W. H. Gibson, Manly road, Tingalpa	Gibson's	White Leghorns and Australorps
Gisler Bros., Wynnum	Gisler Bros.	White Leghorns
G. Grice, Loch Lomond	Kiama	White Leghorns
J. W. Grice, Loch Lomond	Quarrington	White Leghorns
Mrs. M. Grillmeier, Mount View, Milman	Mountain View	Australorps, Minorcas, and Rhode Island Reds
C. & C. E. Gustafson, Tannymorel	Bellevue	Australorps, White Leghorns, and Rhode Island Reds
P. Haseman, Stanley terrace, Taringa	Black and White	Australorps and White Leghorns
C. Hodges, Kuraby	Kuraby	Anconas and White Leghorns
J McCulloch, Whites road, Manly	Hindes Stud Poultry Farm	White Leghorns, Australorps, and Brown Leghorns

Name and Address.	Name of Hatchery.	Breeds Kept.
A. Malvine, junr., The Gap, Ashgrove	Alva ..	White Leghorns and Australorps
H. L. Marshall, Kenmore ..	Stonehenge ..	White Leghorns and Australorps
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White Leghorns, and Langshans
J. A. Miller, Racecourse road, Charters Towers	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	Australorps, Brown Leghorns, and White Leghorns
Mrs. H. I. Mottram, Ibis avenue, Deagon	Kenwood Electric Hatcheries	White Leghorns
J. W. Moule, Kureen	Kureen ..	White Leghorns and Australorps
D. J. Murphy, Marmor ..	Ferndale ..	White Leghorns, Brown Leghorns, Australorps, Silver Campines, and Light Sussex
S. V. Norup, Beaudesert Road, Cooper's Plains	Norup's ..	White Leghorns and Australorps
H. W. & C. E. E. Olsen, Marmor	Squaredeal Poultry Farm	White Leghorns, Australorps, Black Leghorns, Brown Leghorns, and Anconas
A. C. Pearce, Marlborough ..	Marlborough Stud Poultry Farm	Australorps, Rhode Island Reds, Light Sussex, White Wyandottes, Langshans, Khaki Campbell and Indian Runner Ducks, and Bronze Turkeys
E. K. Pennefather, Oxley Central	..	Australorps and White Leghorns
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farm	White Leghorns, Australorps, Langshans, Rhode Island Reds, and Brown Leghorns
G. R. Rawson, Mains Road, Sunnybank	Rawson's ..	Australorps
J. Richards, Atherton	Mount View Poultry Farm	White Leghorns and Australorps
H. K. Roach, Wyandra	Lum Burra ..	White Leghorns and Australorps
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
A. Smith, Beerwah	Endcliffe ..	White Leghorns and Australorps
A. T. Smith, The Gap, Ashgrove	Smith's ..	White Leghorns and Australorps
T. Smith, Isis Junction	Fairview ..	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
A. J. Teitzel, West street, Aitkenville, Townsville	Teitzel's ..	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's Poultry Farm	White Leghorns and Australorps
W. A. Watson, Box 365, P.O., Cairns	Hillview ..	White Leghorns
G. A. C. Weaver, Herberton road, Atherton	Weaver's Stud Poultry Farm	Wyandottes, Indian Game, Barred Rocks, Australorps, White Leghorns, Anconas, Rhode Island Reds, Buff Orpingtons, Black Orpingtons, and Buff Leghorns.
T. Westerman, Handford road, Zillmere	Zillmere ..	Australorps and White Leghorns
H. M. Witty, Kuraby	..	White Leghorns and Australorps
P. A. Wright, Laidley ..	Chillowdeane ..	Brown Leghorns, White Leghorns and Australorps
R. H. Young, Box 18, P.O., Babinda	Reg. Young's ..	White Leghorns, Brown Leghorns and Australorps

Protect the Potato Crop against Irish Blight.

IRISH blight is a disease which is well known to most experienced potato and tomato growers. Black, water-soaked areas of decay make their appearance on leaves and stalks during cool, showery weather. These will become dry and papery if there is a dry change, but when rain or misty weather continues the disease will rapidly spread until the whole of the foliage becomes blighted and the plant dies to the ground. The disease may pass down the underground stems and infect the tubers, or these may be infected direct through exposed surfaces before or after digging. The symptoms in the tuber consist of a sunken and darkened condition of the skin, beneath which is a varying area of brown decay extending into the flesh. When stored under moist conditions, affected tubers may rot completely.

The development of this disease is closely bound up with weather conditions. The causal agent is a fungus which, in Queensland, is unable to grow during the warm summer months. Hence, blight only appears during the late autumn, winter, and spring. The fungus is also dependent on moist, showery weather for the production of its delicate spores and its rapid development and spread. It is for this reason that the disease is sporadic in its appearance, and varies in severity with the nature of the season.

The fact that Irish blight is not serious every year tends to make many farmers somewhat lax in regard to doing anything for the control of the disease. There is, however, a definite risk attached to this attitude, and potato-growers are strongly advised to give serious attention to the control measures outlined below.

Spray the plants thoroughly with Bordeaux mixture. Commence when the plants are young, before the disease becomes well established, and repeat the application during the growth of the crop so as to keep the foliage well covered. About three applications during a dry season and five during a wet one are usually sufficient. Plants should not be sprayed when they are wilting from want of water, as some spray burn may result.

The spray should be made up at the strength of 4 lb. bluestone and 4 lb. hydrated lime to 40 gallons of water. Approximately 150 gallons of spray are required for 1 acre of fair-sized plants. Spraying can be carried out with a knapsack pump, but a larger outfit such as a barrel pump is more convenient for treating large areas. Directions for preparing Bordeaux mixture may be obtained on application to the Department of Agriculture and Stock.

EXPORT OF CAGE-BIRD SEED TO NEW ZEALAND.

Recent amendments to regulations under the New Zealand Stock Act, which governs the importation of agricultural seeds from Australia, make special provision for the importation from Queensland—subject to conditions in respect of fumigation and branding—of agricultural seeds grown in Queensland which are suitable for use as cage-bird feed. Except for this special provision for the admission of cage-bird feed, which is the outcome of representations made last year to the New Zealand Minister for Agriculture by the Minister for Agriculture and Stock (Hon. F. W. Bulcock), the importation into New Zealand of agricultural seed grown in Queensland is totally prohibited.

The conditions under which cage-bird seed from Queensland may be admitted to New Zealand are—Before shipment to the Dominion the seed must be fumigated with carbon bisulphide at a strength of 10 lb. to 1,000 cub. ft. of chamber space for a period of not less than twenty-four hours. Each package must be branded with the words "Cage-bird Seed." Each consignment of seed must be accompanied by statutory declarations in the prescribed forms by the consignor and an inspector of the Department of Agriculture, declaring that the seed is the produce of Queensland, its exact locality of production, and that it has been fumigated in accordance with the New Zealand regulations.

EFFECTS OF DOWNY MILDEW AT MACKAY.

Some time ago the Bureau announced the yield results for three of the seedlings raised at the Mackay Station. Of these a new variety known locally at "C. 83" was of outstanding merit in respect of tonnage yield per acre. For three crops (plant, first and second ratoon), it yielded 17·3 tons of C.C.S. per acre, as compared with 12·3 tons of C.C.S. for the standard, Q. 813.

The new cane is a seedling of P.O.J. 2878, and unfortunately carries the susceptibility to downy mildew disease exhibited by its parent. It is, therefore, not possible to have this cane released for general distribution, solely for the reason that the presence of this disease in Mackay would render it a ready victim in virtually all areas.

Growers will therefore appreciate that the ill effects of cane diseases lie not only in their influence on the present standard canes, but also in the restrictions they place automatically on new canes which do not happen to be resistant. Again, it is evident that diseases are costly from whichever aspect they are viewed, and all farmers should exert a strenuous and concentrated effort to eradicate them. This seedling will be maintained in isolation but will not be released for planting until such time as the downy mildew situation is satisfactorily cleaned up.

—H.W.K., in "The Cane Growers' Quarterly Bulletin."

Control of Cabbage Pests.

IN common with other crop plants, the cabbage is subject to the attacks of a number of insect pests which, if not adequately controlled, are capable of completely destroying the plants or at least rendering them unfit for market. Every grower should know these insect pests, and should be prepared to carry out the necessary control measures. It is now generally recognised that, as a health safeguard, a poison such as arsenate of lead, formerly in common use, must not be applied to edible foliage. As there is available on the market a range of insecticides containing derris, which is toxic to most leaf-eating insects of the cabbage but non-poisonous to man, the use of arsenate of lead on this type of plant is unnecessary. Derris is sold under various trade names ready for application as a dust, or in a form suitable for mixing into a spray, and is marketed by most dealers in insecticides.

During the period of seed-bed growth the young plants should be given frequent applications of derris in either spray or dust form. Such treatment will reduce any incipient infestations of cabbage grubs or cabbage aphis.

In the field the young transplants may be destroyed during their early stages of growth by either cutworms or false wireworms. Both of these insects feed at night, the young plants being usually cut down at ground level. Cutworms are particularly injurious in the spring months, but damage by false wireworms has been experienced at other times in the year. Whenever this cutting of seedlings is noticed, an immediate application of the well-known cutworm bran bait should be made; late afternoon is the best time for the application.

The commonest insect pest of the half to full grown plant is the cabbage moth, whose caterpillars eat numerous holes into the foliage. The caterpillars are small, green in colour, and, owing to their activity when disturbed, they are often referred to as green wrigglers. This insect breeds more rapidly in the summer, but it may be found on the plants throughout the year.

Thorough application of derris sprays or dusts once a week on the plants throughout their period of field growth will give adequate protection against this insect and also prevent any noticeable infestations of cabbage aphis. This aphis usually occurs in clusters of small, slow-moving insects covered by a whitish mealy secretion, the clusters being associated with curled and malformed foliage. These insects feed by sucking the sap, and, both because of the malformation and the lowered vitality of the plant that accompany infestation, their control is necessary.

In the summer months a caterpillar generally referred to as the centre grub is frequently serious. This insect may burrow down the centre of young transplants into the stalk, and thus kill out the growing point. As the root system of the plant is usually established by this time, a number of suckers will be produced. By cutting away all but the best of these, a satisfactory plant may later be produced. Derris applications are less effective against this insect than against larvæ of the cabbage moth.

Unfortunately, that well-known pest, the corn-ear worm, occasionally causes serious injury to cabbages. The only line of attack that can be suggested is to grow cabbages as far as possible from alternative host crops, such as tomatoes, maize, and cotton, and to eliminate weed growth in and near the cabbage area.

As general measures, crop residues should, as far as possible, be gathered and destroyed at the end of a crop and, if practicable, successive plantings should not be made on closely adjacent areas. These precautions will reduce the carry-over of the various insects.

CULTIVATION OF CANE FOR FODDER PURPOSES.

The amended "Sugar Experiment Stations Act" provides that within a mill area only approved varieties of sugar-cane may be planted, whatever the purpose for which the cane is intended. In this case growers are reminded that a mill area comprises all the land, whether assigned or not, within the general area over which the assigned land is distributed.

Lists of approved varieties for each mill area have already been issued and given due publicity. In addition, however, the Act provides that the Governor in Council may gazette varieties of cane which may be grown for fodder purposes, and it is proposed to gazette such varieties in the near future.

Accordingly it is asked that all persons who desire to plant for fodder purposes any variety of cane not otherwise approved for planting in their particular mill area, should communicate immediately with the Director, Bureau of Sugar Experiment Stations, Brisbane, giving the mill area and the variety it is desired to plant.

It should be pointed out that owing to the Fiji disease situation in Southern Queensland no canes of the Uba type will be approved for fodder purposes within a mill area in those parts.

—*H.W.K.*

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

THE weather during the month made it difficult to maintain the upward trend in prices. Intermittent showers affected adversely the carrying quality of the softer fruits to distant markets. In some pineapple consignments there were traces of blackheart, and cases of rubbery bananas were reported. Notwithstanding these handicaps, good fruit was in firm demand.

The following were the ruling market prices during the last week of the month of July, 1939:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Small, 8s. 6d. to 9s. 6d.; sixes, 9s. 9d. to 11s. 6d.; sevens, 12s. to 14s.; eights and nines, 15s. to 16s. per acre.

Sydney.—Cavendish: Sixes, 12s. to 15s.; sevens, 15s. to 18s.; eights and nines, 18s. to 20s.

Melbourne.—Cavendish: Sixes, 12s. to 15s.; sevens, 14s. to 17s.; eights and nines, 16s. to 19s.

Adelaide.—Cavendish: Sixes and sevens, 16s. to 22s.

Newcastle.—Cavendish: Sixes and sevens, 13s. to 20s.

Reports of squirter from Sydney.

Lady's Finger, 2½d. to 6d. per doz.; Cavendish, to 8d. per dozen.

Pineapples.

Brisbane.—Smoothleaf, 4s. to 7s. per case; loose, 1s. 6d. to 5s. per dozen; Ripley, 4s. to 6s. per case; loose, 1s. 6d. to 3s. per dozen.

Sydney.—Smoothleaf, 8s. to 12s.; specials higher.

Melbourne.—Smoothleaf, 7s. to 12s.

Newcastle.—7s. to 12s.

Papaws.

Brisbane.—Yarwun, 5s. to 8s. tropical case; Gunalda, 3s. 6d. to 4s. 6d. bushel; locals, 1s. 6d. to 3s. bushel.

Sydney.—6s. to 12s. tropical case; many lines green.

Melbourne.—7s. to 14s. tropical case.

Newcastle.—9s. to 10s.

Custard Apples.

Brisbane.—2s. 6d. to 3s. per half-bushel.

Sydney.—6s. to 8s. half-bushel.

Melbourne.—5s. to 7s. half-bushel.

Passion Fruit.

Brisbane.—Firsts, 7s. to 9s.; seconds, 5s. to 6s.

Sydney.—3s. to 7s.

Melbourne.—8s. to 12s.

Other Tropical Fruits.

Cape gooseberries, 5d. to 6d. per lb.

CITRUS FRUITS.

Oranges.

Brisbane.—Gayndah, 7s. to 11s.; locals, 6s. to 9s.; Howard, 6s. to 10s.; New South Wales navels, 8s. to 10s.

Mandarins.

Brisbane.—Emperors, 6s. to 9s.; Scarlets, 6s. to 9s.; Gayndah Glens, 8s. to 14s.

Grapefruit.

Brisbane.—6s. to 8s. bushel.

Lemons.

Brisbane.—Locals, 4s. to 7s.; Gayndah, 6s. to 12s.

DECIDUOUS FRUITS.

Apples.

Brisbane.—Jonathan, 6s. to 12s.; Granny Smith, 8s. to 12s.; Cleopatra, 8s. to 10s.; Aromatic, 5s. to 8s.; French Crab, 4s. to 7s.; Rome Beauty, 9s. to 12s.; Scarlets, 6s. to 9s.; Sturmer, 6s. to 8s.; Yates, 10s. to 13s.; Democrat, 6s. to 9s.

Pears.

Brisbane.—Josephine, 8s. to 13s.; Packham's Triumph, 6s. to 11s.; Winter Cole, 9s. to 15s.

OTHER FRUITS.

Tomatoes.

Brisbane.—Ripe, 3s. to 6s.; coloured, 4s. to 8s.; green, 3s. to 5s.

Sydney.—Cleveland, 4s. to 6s.; Bowen, 5s. to 7s.

Melbourne.—Adelaide tomatoes, 13s. to 15s.; West Australian, 6s. to 10s.; repacked higher.

MISCELLANEOUS, VEGETABLES, &c.

Cucumbers.—*Brisbane:* 5s. to 7s.

Pumpkins.—4s. to 5s. 6d. bag.

Marrows.—1s. 6d. to 2s. dozen.

Lettuce.—6d. to 1s. 6d. dozen.

Cabbages.—1s. 6d. to 2s. 6d.; prime to 5s. dozen.

Cauliflowers.—1s. 6d. to 3s. 6d.; large, 8s. to 12s.

Beans.—*Brisbane:* 6s. to 8s. sugar bag. *Melbourne:* 4d. to 7d. lb.

Peas.—*Brisbane:* 8s. to 10s. sugar bag.

Beetroot.—4d. to 1s. bundle.

Chokos.—9d. to 1s. dozen.

Plate 103.

DEMONSTRATING THE POINTS OF A BERKSHIRE BOAR AT THE FARMERS' WINTER SCHOOL, QUEENSLAND AGRICULTURAL COLLEGE.—In the group (left to right) are Mr. E. J. Shelton, H.D.A. (Senior Instructor in Pig Raising, Departm nt of Agriculture and Stock, demonstrator), Messrs. W. Ley, C. Nothling, R. Parsons, W. O'Connor, W. T. Jones, Wm. Robb, W. Svendsen, G. Murphy, H. Svendsen, A. H. Calvert, C. R. Maunsell, A. H. McKell, W. Adlem, and N. W. Briton, B.V.Sc. (Lecturer in Animal Husbandry, Queensland Agricultural High School and College).

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of The Australian Illawarra Shorthorn Society, Jersey Cattle Society, Ayrshire Cattle Society, and Friesian Cattle Society production charts for which were compiled during the month of June, 1939 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORN.			
	MATURE COW (STANDARD 350 LB.).			
Penrhos Pansy II.	A. Sandilands, Junr., Penrhos, Wildash	13,950·6	662·653	Rosenthal Pendant's Prince
Rosenthal Lilac III.	S. J. H. Mitchell, Rosenthal, Warwick	12,063·1	481·462	Rosenthal Handsome Boy
Happy Valley Lovely 2nd	R. R. Radel, Happy Valley, Coalstoun Lakes	11,145·2	457·753	Molly's Hero of Glenthorn
Fairlie Fuchsia 11th	C. B. Mitchell, Fairlie, Rosenthal	9,820·72	404·487	Rosenthal Dividend
Sunnyside Ruby 21st	P. Moore, Wooroolin	8,942·1	388·913	Countess Lad of Cosey Camp
Murray's Bridge Choice	A. T. Paull, Bowenville	8,557·6	372·561	Valiant of Greyleigh
Braemar Sunray	A. T. Paull, Bowenville	7,929·75	357·585	Braemar Keith
Palmeto Polly	Rex Tweed, Kandanga	7,780·95	352·805	Glengallan Mayor
	SENIOR, 4 YEARS (STANDARD 330 LB.).			
Fairlie Princess 24th	C. B. Mitchell, Fairlie, Rosenthal	8,032·08	379·593	Rosenthal Carbine
	JUNIOR, 4 YEARS (STANDARD 310 LB.).			
Brundah Cora	C. O'Sullivan, Ascot, Greenmount	9,945·58	395·727	Karawarra Enchanter
	SENIOR, 3 YEARS (STANDARD 290 LB.).			
Trevor Hill Twinkle	Geo. Gwynne, Umbiram	9,624·65	377·441	North Glen Emblem
Fairlie Princess 25th	C. B. Mitchell, Fairlie, Rosenthal	7,877·78	349·973	Rosenthal Carbine
Rosenthal Maggie 14th	S. J. H. Mitchell, Rosenthal, Warwick	7,098·04	300·003	Rosenthal Carbine 2nd
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Trevor Hill Satin	Geo. Gwynne, Umbiram	9,043·26	385·116	North Glen Emblem
Brundah Fancy	C. O'Sullivan, Ascot, Greenmount	8,211·76	316·429	Greyleigh Eros
Pilton View Countess	P. D. Feichtner, Pilton View, Greenmount	7,529·2	309·194	Navillus Venus Shiek
Palmeto Mary	Rex Tweed, Kandanga	7,902·5	302·012	Glengallan Mayor

	Senior, 2 Years (Standard 250 Lb.).			
Sunnyside Clover 27th	P. Moore, Wooroolin	7,724·8	316·934	Patrol of Cosey Camp
Brundah Norma 3rd	C. O'Sullivan, Ascot, Greenmount	7,492·71	309·885	Greyleigh Eros
Brundah Myra	C. O'Sullivan, Ascot, Greenmount	7,136·06	292·39	Greyleigh Eros
Murray's Bridge Sadie 2nd	P. D. Feichtner, Pilton View, Greenmount	5,725·05	287·453	Greyleigh Winall
	Junior, 2 Years (Standard 230 Lb.).			
Pilton View Little Prim	P. D. Feichtner, Pilton View, Greenmount	7,518·7	332·606	Navillus Venus Sheik
Pilton View Red Queen	P. D. Feichtner, Pilton View, Greenmount	7,886·6	306·024	Navillus Venus Sheik
Rosenthal Hope 19th	S. J. H. Mitchell, Rosenthal, Warwick	7,314·25	298·498	Rosenthal Peggy's Admiration
Pilton View Dolly	P. D. Feichtner, Pilton View, Greenmount	6,703·6	280·689	Navillus Venus Sheik
Valera Bonny 2nd	Sullivan Bros., Pittsworth	6,652·59	257·306	Kilburnie Royalist
Navillus Vision 3rd	C. O'Sullivan, Ascot, Greenmount	6,971	250·798	Parkview Mars
Highfields Perfect 8th	J. A. Heading, Highfields, Murgon	6,068	241·81	Greyleigh Legend
Pilton View Fussy	P. D. Feichtner, Pilton View, Greenmount	5,858·05	230·13	Navillus Venus Sheik
	JERSEY.			
	Mature Cow (Standard 350 Lb.).			
Brooklands Royal Lily	W. S. Conochie, Sherwood	8,558	465·513	Retford Earl Victor
Glenview Sunflower	F. P. Fowler and Son, Glenview, Coalstoun Lakes	9,100·2	420·67	Trinity Officer
Westbrook Tulip 23rd	Farm Home for Boys, Westbrook	7,519·55	414·769	Carnation Scot's Noble
Trecarne Madieraette 3rd	J. Schull, Lermont, Oakey	6,828·6	377·025	Trecarne Golden King
	Senior, 4 Years (Standard 330 Lb.).			
Glenview Hopeful	F. P. Fowler and Son, Glenview, Coalstoun Lakes	9,548·35	544·868	Trinity Governor's Hope
Westbrook Sultane	Farm Home for Boys, Westbrook	7,489·45	361·048	Westbrook Prince
	Junior, 4 Years (Standard 310 Lb.).			
Lady May of Inverlaw	R. J. Crawford, Inverlaw, Kinagroy	7,523·1	380·552	Woodside Felucca's Gamboge
	Senior, 3 Years (Standard 290 Lb.).			
Bellgarth Viola II.	D. R. Hutton, Bellgarth, Cunningham	7,319·23	398·895	Trecarne Renown II.
Trinity Golden Rosena	A. H. O. Koppen, Peeramon	6,345·85	384·006	Trinity Nobly Born
Glenview Design	F. P. Fowler and Son, Glenview, Coalstoun Lakes	6,403·05	326·592	Trinity Governor's Hope
Lermont Fairy	J. Schull, Lermont, Oakey	6,051·35	324·399	Woodside Golden Volunteer
Day Dawn of Peeramon	A. H. O. Koppen, Peeramon	6,006·9	317·379	Trinity Segunda's Prince
Nancy of Windy Way	Wakefield Bros., Upper Barron, Atherton	5,417·7	292·686	Royal Emblem 2nd of Rosedale

Production Recording—*continued.*

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	JERSEY—*continued.*			
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Lermont Silver Bell (Twin)	J. Schull, Lermont, Oakey	7,385·1	424·278	Woodside Golden Volunteer
Brooklands Sultan's Tea Cake	W. S. Conochie, Sherwood	7,391·6	352·106	Brooklands Royal Sultan
Carnation Dainty Aster 2nd	R. J. Crawford, Inverlaw	5,201·62	313·478	Vinchelez Golden Victory
Westbrook Tulip 71st	Farm Hone for Boys, Westbrook	6,001·35	297·729	Oxford Golden Dreamer
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
Pineview Spotted Queen	E. Burton and Sons, Wanora	6,024·8	349·667	Oxford Peer
Oxford Golden Rosina	R. J. Crawford, Inverlaw, Kingaroy	4,760·26	273·105	Oxford Golden Remus
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Glenview Mischief	F. P. Fowler and Son, Glenview, Coalstoun Lakes	7,723·8	421·767	Trinity Governor's Hope
Grange Vale Patricia	T. R. Gillespie, Ravenshoe	6,660·85	383·211	Eclipse of Brook Lodge
Lermont Kitty	J. Schull, Lermont, Oakey	7,439·3	375·346	Woodside Golden Volunteer
Lermont Dawn	J. Schull, Lermont, Oakey	7,121·6	320·288	Lermont Officer
Inverlaw Daisybelle	R. J. Crawford, Inverlaw, Kingaroy	6,228·55	319·817	Oxford Royal Lad
Lermont Chime	J. Schull, Lermont, Oakey	6,137·3	313·296	Woodside Golden Volunteer
Lermont Madiera	J. Schull, Lermont, Oakey	5,686·2	310·952	Woodside Golden Volunteer
Wyreen Gentle	C. W. Barlow, Spring Creek, Toowoomba	5,189·16	274·119	Lyndhurst Majesty
Oak Park Marina's Maid	Miss J. Nolan, Lindum	5,250·2	268·379	Banyule Lord Tiddlewinks
Inverlaw Princess Victorious	R. J. Crawford, Inverlaw	4,959·63	267·27	Carnation Gentle Prince
Bellgarth Bertha 3rd	P. Kerlin, Killarney	4,936·15	262·321	Trecarne Renown 2nd
Glenview Sultane's Royal	F. P. Fowler and Son, Glenview, Coalstoun Lakes	5,029·75	262·078	Trinity Governor's Hope
Inverlaw Celia	R. J. Crawford, Inverlaw, Kingaroy	5,474·22	246·14	Oxford Royal Lad

AYRSHIRE.				
Mature Cow (Standard 350 Lb.).				
Fairview Lady Bess (242 days)	R. M. Anderson, Southbrook	12,924·55	472·786	Longlands Bonnie Willie
Junior, 3 Years (Standard 270 Lb.).				
Myola Joy 2nd	R. M. Anderson, Southbrook	9,188·95	339·914	Benbecula Bonnie Willie
FRIESIAN.				
Junior, 3 Years (Standard 270 Lb.).				
Maroombin Dulcie	A. Brown, Fullham, Toogoolawah	9,883·6	288·894	Burndral Alcartra Pietje

Sugar Levies.

(Abbreviated Notice.)

1939 SEASON.

Regulations under "*The Primary Producers' Organisation and Marketing Acts,* 1926 *to* 1938," have been approved, providing for levies on suppliers of cane to sugar-mills at the following rates for the season 1939 [the figures for 1937 and 1938 are given for comparison purposes]—

Name of Mill.	General Levy by Queensland Canegrowers' Council.	Administrative Levy by District Executive.	Administrative Levy by Mill Suppliers' Committee.	Special Levy by Mill Suppliers' Committee.	Total Levies for 1939.	Total Levies for 1938, given for comparison.	Total Levies for 1937, given for comparison.
	d.	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*
Mossman Central	½	2	..	..	2½	2	2
Hambledon	½	¼	¼	..	1	1¼	1¼
Babinda Central	½	¼	⅛	..	⅞	1 1/16	1 3/16
Mulgrave Central	½	¼	..	..	¾	1	1
South Johnstone Central	½	1½	..	..	2	2¼	2¼
Goondi	½	1½	..	..	2	2¼	2½
Mourilyan	½	1½	..	..	2	2¼	2¼
Tully River Central	½	1¾	..	..	2¼	2½	2½
Macknade	½	½	½	..	1½	1¾	1¾
Victoria	½	½	½	..	1½	1¾	1¾
Kalamia	½	..	⅞	⅝	2	1¾	2¼
Pioneer	½	..	1	¾	2¼	2¼	2⅜
Inkerman	½	..	½	..	1	1¼	1⅛
Invicta	½	..	1½	..	2	2¼	2¼
Proserpine Central	½	1	..	..	1½	1¾	1¾
Cattle Creek Central	½	½	½	..	1½	1¾	1½
Plane Creek Central	½	½	⅜	..	1⅜	1⅝	1¾
Marian Central	½	½	½	..	1½	1¾	2¼
North Eton Central	½	½	..	..	1	1¼	1¼
Pleystowe	½	½	¼	½	1¾	2	2¼
Racecourse Central	½	½	½	..	1½	1¾	1¾
Farleigh	½	½	½	..	1½	1¾	1¾
Qunaba	½	1¼	½	..	2¼	2¾	1¾
Bingera	½	1¼	½	..	2¼	2¾	1¾
Fairymead	½	1¼	¾	..	2½	3	2
Gin Gin Central	½	1¼	¾	..	2½	3	3¼
Millaquin	½	1¼	¼	..	2	2½	1½
Isis Central	½	½	..	..	1	1¼	1¼
Maryborough	½	¾	..	..	1¼	1½	1½
Mount Bauple Central	½	¾	..	..	1¼	1½	1½
Moreton Central	½	¼	1	½	2¼	2¾	2¼
Rocky Point	½	¼	¾	..	1½	1¾	1½
Eagleby	½	¼	¾	..	1½	1	¾

No poll will be taken in respect of the General Levy of ½d. per ton (first column) for the Queensland Cane Growers' Council, or for the administrative levies by District Executives or Mill Suppliers' Committees (second and third columns).

In the fourth column, the levies on cane supplied to the Kalamia, Pioneer, Pleystowe, and Moreton Central Mills will be used in defraying the costs of employing farmers' representatives at those mills for the

current season. In the case of these levies, growers may petition for a poll, and the petition must be signed by at least 100 or 50 per cent. (whichever shall be the less) of the growers who are suppliers of cane to the five mills concerned.

In addition to the foregoing levies, the undermentioned Mill Suppliers' Committees are empowered to make particular levies on growers within each of the following districts, at the following rates:—

Name of Mill Suppliers' Committee and Mill to which Cane is Supplied.	Description of District upon the Growers wherein Levies will be made and description of Cane upon the Growers whereof Levies will be made.	Amount of Levy per ton of Cane Supplied.	Purposes of Levy.
		d.	
Isis Central ..	All cane consigned on the railway by Government trucks from Booyal, Junien, and Marule Sidings on the Dallarnil Railway	¼	To be used for administrative purposes by Booyal Branch of Isis Central Mill Suppliers' Committee.
Mount Bauple Central	Mount Bauple district within the boundaries of the parishes of Gundiah, Tiaro, Gootchie, Curra, and St. Mary	¼	To be used for administrative purposes by Mount Bauple Branch of Mount Bauple Mill Suppliers' Committee.
Mount Bauple Central	Yerra-Mungar district within the boundaries of the parishes of Gungaloon, Denison, Doongul, Woocoo, and Young	¼	To be used for administrative purposes by Yerra-Mungar District Branch of Mount Bauple Mill Suppliers' Committee.
Maryborough ..	That part of the Pialba district within the boundaries of the parishes of Urangan, Vernon, and Bingham, county March, which comprises lands which were heretofore assigned to the Isis Mill, but are presently assigned to the Maryborough Mill	1½	To be used for administrative purposes by the formerly Isis section of the Pialba District Branch of Maryborough Mill Suppliers' Committee.
Maryborough ..	That part of the Pialba district within the boundaries of the parishes of Vernon, Urangan, and Bingham, county March, which comprises lands which were heretofore and are presently assigned to the Maryborough Mill	¾	To be used for administrative purposes by the original Maryborough section of the Pialba District Branch of Maryborough Mill Suppliers' Committee.
Maryborough ..	Maryborough district within the boundaries of the parishes of Tinana, Maryborough, Bidwell, Elliott, Young, and Walliebum, county March	¼	To be used for administrative purposes by Maryborough District Branch of Maryborough Mill Suppliers' Committee.
Racecourse Central	All cane hauled over Silent Grove tramline	2	To defray the costs of employing a farmers' representative of the section of growers concerned at the Racecourse Mill for the current season.
Marian Central ..	All cane loaded at Dow's Creek and Langdon Siding	¾	To be used for insurance and weighbridge maintenance by the Dow's Creek and Langdon Branch of the Marian Central Mill Suppliers' Committee.

Growers are given the opportunity of petitioning for a poll to decide whether or not the above levies shall be made. The petition must be signed by at least 100 or 50 per cent. (whichever shall be the less) of the growers who are cane suppliers within any of the areas concerned.

All petitions must reach the Secretary for Agriculture and Stock, Department of Agriculture and Stock, Brisbane, on or before the 14th August, 1939.

Full particulars of these Regulations appear in the *Government Gazette* of the 15th July, 1939, or may be obtained on application to the managers of the various sugar-mills in Queensland or to the undersigned—

R. P. M. SHORT, Acting Under Secretary,
Department of Agriculture and Stock,
Brisbane.

General Notes

Staff Changes and Appointments.

Mr. C. Schindler, inspector under the Diseases in Plants Acts, has been transferred from Stanthorpe to Warwick.

Mr. J. F. Emerick (Bundaberg) and Miss M. Whitla have been appointed assistant cane testers for the current sugar season at the Plane Creek and Invicta mills, respectively.

The following members of the Proserpine District Cane Growers' Executive have been appointed honorary protectors under "*The Fauna Protection Act of* 1937":—Messrs. G. Telford (Strathdickie), T. G. Mann (Lethebrook), E. D. Beck (Conway), R. W. Brown (Kelsey Creek), W. D. Dodd (Crystalbrook), A. Johnson (Preston), H. W. Holmes (Cannon Valley), R. T. Fahey (Bowen road, Proserpine), H. Considine (Bloomsbury), and G. Yorke (Elaroo).

Mr. A. H. Strohfeldt, Quarry street, Woolloongabba, has been appointed an inspector under the Diseases in Stock Acts, the Slaughtering Act, and the Dairy Produce Acts, Department of Agriculture and Stock, and will be stationed at the Oxley bacon factory.

Sergeant M. Forry (Clermont) has been appointed also an inspector under the Brands Acts. Constable A. J. Haines, of the same station, has been given the additional appointments of inspector under the Brands Acts and inspector under the Slaughtering Act.

Mr. P. S. Bleney, Dingo, has been appointed an honorary protector under the Fauna Protection Act in respect of the sanctuary comprising the property of J. P. Landsberg, near Dingo.

Mr. C. C. Barth, District Inspector of Stock, Townsville, has been appointed also an inspector of dairies.

Constable T. W. Weller, Hungerford, has been appointed also an inspector under the Slaughtering Act.

Mr. K. Livingstone, secretary of the Herbert River Cane Growers' Association, Ingham, has been appointed canegrowers' representative on the Macknade Local Sugar Cane Prices Board.

Mr. A. W. England, Biloela, has been appointed an honorary protector under the Fauna Protection Act.

Mr. J. M. Harvey, assistant to analysts, Agricultural Chemical Laboratory, Department of Agriculture and Stock, has been appointed analyst in the Agricultural Chemical Laboratory.

The appointment of Mr. Joseph Pedelty, loader for the Committee of Direction of Fruit Marketing at Burrum, as an inspector under the Diseases in Plants Acts has been cancelled, and Mr. John Pedelty, of Burrum, has been given a similar appointment.

Sergeant W. J. Barrett (Injune) and Constable T. R. Doyle (Mount Larcom) have been appointed also inspectors under the Brands Acts.

Egg Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts, amending the constitution of the Egg Board to provide that election of growers' representatives on the board shall be held triennially, and that members of the board shall hold office for a period of three years.

C.O.D.—Sectional Group Committees.

Regulations have been issued under "*The Fruit Marketing Organisation Acts,* 1923 *to* 1934," constituting the electorates for the purpose of electing members of the banana, pineapple, citrus, deciduous, and other fruits sectional group committees.

Wild Life Preservation.

Two sanctuaries have been declared under the Fauna Protection Act—the first, an area comprising portion of the Nogoa River, adjacent to the town of Emerald; and the second, the bed and banks of the Ross River, Townsville, from its confluence with Five-mile Creek downwards to its mouth.

Bundaberg-Childers District Quarantine Area.

A Proclamation has been issued under "*The Sugar Experiment Stations Acts*, 1900 *to* 1938," amending a Proclamation issued in March last declaring the Bundaberg-Childers quarantine district to be a quarantine area, and prohibiting the removal of sugar-cane which has been Fiji and/or downy mildew disease infected within three years of the time of removal, by providing that a permit in writing must be obtained from the Director of Sugar Experiment Stations before any such removal can be effected.

Sugar-cane as Fodder.

An Order in Council has been issued under "*The Sugar Experiment Stations Acts*, 1900 *to* 1938," declaring that the undermentioned varieties of sugar-cane, which are used solely as fodder for animals and not for the manufacture of cane sugar, may be grown for fodder purposes only in the mill areas as set forth hereunder:—

Variety of Sugar-cane: Uba, Co. 290, and "Improved Fodder Cane."

Mill Area: Mossman, Hambledon, Mulgrave, Babinda, Goondi, Mourilyan, South Johnstone, Tully, Macknade, Victoria, Invicta, Kalamia, Pioneer, and Inkerman.

Variety of Sugar-cane: Uba and "Improved Fodder Cane."

Mill Area: Proserpine, Farleigh, Racecourse, Pleystowe, Marian, Cattle Creek, North Eton, and Plane Creek.

Variety of Sugar-cane: 90 Stalk, "Improved Fodder Cane," and C.S.R. 1 (also known as E.G.).

Mill Area: Bingera, Fairymead, Millaquin, Qunaba, Gin Gin, Isis, Maryborough, Mount Bauple, Moreton, Eagleby, and Rocky Point.

Apiaries Act.

Section 21 of "*The Apiaries Act of* 1938" prohibits the introduction into Queensland of any bees, bee combs, beeswax, honey, or appliances unless they are accompanied by a certificate, as prescribed, from an approved officer of the Department of Agriculture in the country or State of origin certifying that the same come from a district in which foulbrood or "Isle of Wight" disease, or any disease proclaimed by the Governor in Council to be a disease, do not exist.

A Proclamation issued under the abovementioned Act declares that, in addition to the diseases abovementioned, nosema disease, bee louse, and sacbrood shall be diseases to which section 21 shall apply.

Pineapple Levy.

It has been approved by the Executive Council that the Pineapple Levy Regulation which was issued in April, 1936, and which has been extended from time to time, be further extended for twelve months from 21st August. The Regulation empowers the Committee of Direction of Fruit Marketing to make a levy, in the interests of the pineapple fruit section of the fruitgrowing industry, on all pineapples—

(*a*) Sold or delivered, whether by rail, road, or boat, to factories, at the rate of 1d. per case;

(*b*) Sold or delivered by rail to any agents or persons other than factories at the rate of 1s. 4d. per ton, with a minimum of 1d., but no levy is collected on single-case consignments;

(*c*) Sold or delivered otherwise than by rail to any Queensland railway station to any agents or persons other than factories, at the rate of ½d. per case, with a minimum of 1d.

Banana Levy.

An Order in Council has been issued under "*The Banana Industry Protection Acts*, 1929 *to* 1937," providing for a levy on banana-growers to be used for the maintenance of the Banana Industry Protection Board.

The levy is similar to that issued last year, and is at the rate of 1½d. per case for bananas marketed in the case, or 2d. in the £1 or part thereof for bananas marketed in the bunch.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of Mr. W. D. Francis, Botanist.

Mimba Seed. A Mangosteen.

S.C.T. (Townsville)—

The Mimba seed comes from the fruit of *Azadirachta indica,* a native of India and Java. The tree resembles our white cedar, to which it is closely allied. In India the bitter oil of the fruit is used as an anthelmintic (to expel worms), and is used to kill insects. This is the only record we can find of its use.

The other specimen has been determined as *Garcinia Xanthocynmus,* a mangosteen of an inferior type which is grown to a limited extent in North Queensland. It is known in the tropics as egg tree, on account of the shape of the fruit. The yellow pulp of the fruit is edible, and possesses an acid flavour. The tree is propagated by seed. It is a native of Southern India.

Trees Suitable for the Fassifern and Lockyer Districts.

W.S. (Kalbar)—

Trees suitable for your district are:—Black Bean (*Castanospermum australe*); Tulip Wood (*Harpullia pendula*); Hill's Fig (*Ficus Hillii*); Moreton Bay Fig (*Ficus macrophylla*); *Cassia Brewsteri*; Portuguese Elm (*Celtis sinensis*).

All are natives of Eastern Australia, except the Portuguese Elm, which comes from Eastern Asia. Young trees of these species could be purchased from the Botanic Gardens, Brisbane, or from the Brisbane City Council, who have a tree nursery at Hamilton. The Botanic Gardens also are under the administration of the Brisbane City Council. In each case, a charge of two shillings per tree is made.

Marshmallow.

G.B. (Cambooya)—

The specimen is Marshmallow (*Malva parviflora*), a very common weed on farms in Southern Queensland, but perhaps not so abundant as it is in other States. In New South Wales this mallow has been accused of causing shivers or staggers in stock, but, although the plant is moderately common here and very abundant on some farms, we have never heard of it causing any trouble.

Gall Weed.

K.M.F. (Tara)—

The specimen has been determined as the gall weed or twin leaf, *Zygophyllum apiculatum.* Up to the present, this plant has not shown itself to be a particularly noxious or spreading plant. However, it is left untouched by stock as a rule, and, because of this, should not be allowed to encroach any further. The best way of eradicating it is by mattocking. This plant has been accused of poisoning stock, but feeding experiments at the Animal Health Station, Yeerongpilly, failed to confirm the assumption of its poisonous properties. It is a native plant.

Jack Bean.

P.O.T. (Didcot)—

The pods come from the native jack bean (*Canavalia obtusifolia*). The seeds are reported to be poisonous to human beings, but the leaves and green stems have recently been reported as good fodder for stock. It is common on some of the sandy coastal lands, and is also found in some areas such as the Gayndah district.

A Mallow.

M.M. (Brisbane)—

The specimen from Aramac has been identified as a mallow, and is known botanically as *Malva parviflora*. This plant has been proved by experiment to be the cause of staggers or shivers in sheep. However, the peculiar symptoms characteristic of this affection are exhibited only when animals which have eaten the plant are driven or exercised. Because of this characteristic, this plant cannot be recommended as a good fodder. Nevertheless it would probably be useful when eaten in limited quantities, along with other herbage and grasses in the paddock, when the stock are not being driven.

Fish Weed.

O.L.H. (Rockhampton)—

The weed from The Caves, Rockhampton, is fish weed (*Chenopodium triangulare*). This plant belongs to the saltbush family and is eaten by stock. It is reputed to be more palatable when it is partly dry. However, it is not a suitable food plant for dairy cows, as it imparts its peculiar fishlike flavour to the milk, cream, and butter.

Prickly Jack.

J.J.S. (Allora)—

The specimen is *Emex australis*, sometimes called devil's thorn, more usually known as cape spinach or prickly jack. It is a native species, and is not known to be poisonous to stock.

Emu Apple.

N.G.W. (Tara)—

Your specimen is from the emu apple, a common western tree which is known botanically as *Owenia acidula*. This tree is a favourite shade tree, because of its ornamental appearance. It does well on brown and black loamy soils. One peculiar property of the tree is that no one has succeeded, so far, in germinating the seeds, which are extremely hard. It is not known to be poisonous to stock.

Teosinte.

N.B.S. (Brooloo)—

The seeds are from *Euchlæna mexicana*, a native of Mexico, and is known there as teosinte. It is often cultivated as a green fodder, and has been introduced into most warm countries. Horses are said to be fond of it, but it has the disadvantage of not being able to stand drought very well.

A Wild Millet. Rice Grass.

Inquirer (Brisbane)—

The specimens from the Aurukun Mission, Gulf of Carpentaria, have been determined as follows:—

(*a*) *Echinochloa Turneriana*, a wild millet. This species is widely distributed in Queensland from the Central-West to the Gulf country. It has generally been stated to be a good fodder. In view of the fact that it is closely allied to such well-known cultivated crops as Japanese millet and white panicum, this is not hard to understand.

(*b*) *Leersia hexandra*, rice grass. This is widely spread over the tropical and subtropical regions of the world in swampy or moist situations. It is usually looked upon as quite a useful fattening grass.

Feather Top Rhodes Grass.

M.F.S. (Clermont)—

The specimen has been identified as Feather Top Rhodes Grass (*Chloris virgata*). This is a native of tropical America. It is spreading in many parts of the State. It is particularly common along the railway line at Emerald. Generally, it is looked upon as an inferior grass. Although it is allied to Rhodes Grass (*Chloris gayana*), it is much less nutritious than that grass.

Rural Topics

Keeping that Spade's Depth of Top Soil.

Trials for control of erosion which are of great interest to farmers as well as graziers are being carried out on a pastoral property just below the Queensland border. On the property, contour furrows have been opened on 200 acres of grazing land. So far, the results have been very pleasing, for not only has the erosion been checked, but also the feed on the treated area is very much better than it was before the erosion trial was started.

The contour furrows prevents the loss of top soil and reduces the run-off of rain water, thus ensuring a good soaking whenever a substantial shower falls.

Two New Fodder Plants.

Here is a very interesting extract from a letter from a grazier in the Goondiwindi district. Referring to a recent visit to his property of a well-known agrostologist, he writes:—"I pointed out a very prolific shrub which I had not noticed elsewhere, and which has taken possession of a large piece of land. He was delighted to see it and named it as a legume, and pointed out the nitrate sacs on the roots—nitrate taken from the air by the plant. The plant is unknown to science . . . . . and as stock eat it readily and it is deep-rooted and drought-resistant, the grass expert thinks it may be the thing we are all looking for.

"Another plant is what we call 'honeysuckle,' which the visiting man of science had not seen before. It is growing on a sand ridge in one of my paddocks, and my visitor thinks it to be the most perfect form of natural drought insurance he has seen.

"Incidentally, he was impressed and pleased, I think, with the system of rotational grazing which I have started on the run."

Grass to Arrest Erosion.

A Russian grass, which was imported from the United States Department of Agriculture, has given good results in arresting sanddrift in the mallee in South Australia. Seed of a number of other grasses which have been found useful in checking soil erosion in the United States, and obtained originally from Russia, has also been imported for trial in Australia.

Many of the grasses are now growing in plots at Canberra, but the best of them are, unfortunately, poor seeders. Cuttings have, however, been made available in limited quantities.

Storage of Surplus Pasture.

A Southern farmer has made a regular practice of conserving the surplus grasses and herbage as silage, with satisfactory results. Last season he mowed the paddocks where possible, leaving the cut on the surface for ten days to dry out before pitting. By using a disc ploughshare to which is attached a heavy crowbar, he has devised an effective method for removing the silage from the pit for feeding to his stock. With this gadget, the material is cut into squares, which can be removed easily by hand or with a fork.

A neighbouring farmer demonstrated the practicability of natural pasture conservation some years ago, when he mowed and stacked as hay 1,400 tons of Mitchell and coolah grass, which was a great drought standby.

Here is the experience of a Riverina grazier: Pits of natural silage, which had been down for more than seven years, and had even been flooded on several occasions, opened up in nutritious condition. The silage not only sustained in good health a large flock of lambing ewes, but fattened the lambs for market under drought conditions.

Baled Straw for Silo Construction.

Here is an idea from New Zealand: The instructor in agriculture at Rangiora High School applied a plan for fodder conservation which had been tried out in America, and that was the use of baled straw for the construction of a silo for storing a fodder crop. In building his silo, he used 4 tons of baled straw in circular formation and he found the job quite simple. The enclosed space was filled to the top with the silage crop. The success or otherwise of the experiment cannot, of course, be judged until the silo is opened, but at present it appears that the silage will be of good quality. It is hoped, of course, that all loss due to the drying-out of the edges of a stack will be eliminated.

Farm Notes

SEPTEMBER.

WITH the coming of warmer weather, weeds of all kinds will be making their appearance on cultivated land and among row crops, but in the latter case they can be effectively dealt with by inter-row cultivation, and, where necessary, by the use of the hoe.

Where crops are sown on thoroughly fallowed land, the greater freedom from weed infestation is at once apparent when compared with adjacent paddocks which have merely received a hurried preparation, so that sowing clean seed on clean land may be amply rewarded in the resultant clean crops and higher returns.

Potatoes planted during July and August will now be making growth, and should be sprayed with Bordeaux mixture as a preventative of blight, particularly if cool, moist weather is experienced. Bordeaux and Burgundy mixtures are not regarded as a cure for blight, but the spray forms a satisfactory protective covering, which, if applied at intervals during growth, will effectively prevent the disease. Where land has received adequate preparation, forming a satisfactory seed-bed, and has a sufficiency of subsurface moisture to induce germination, early sowings of maize, sorghum, Sudan grass, millets, cowpeas, and pumpkins and the planting of sweet potato cuttings may be proceeded with, the farmer's chief concern being to provide a sufficiency of summer-growing fodder and grain crops both for current needs and for storage as seasonal reserves.

The spring maize crop is usually considered an uncertain proposition for grain, as the warm, moist conditions desired during the tasselling period do not always eventuate, but as excellent crops are sometimes obtained the risk is well worth while, especially as the fodder provided can always be put to good use in the event of a failure for grain.

Early-maturing Yellow Dent varieties, such as "Funk's 90-Day," will be found the best for early sowing, as they have the capacity of making the best use of available moisture.

The market prices obtainable are also a consideration, as although early sown maize is usually intended for farm use, any surplus can be disposed of at higher prices than may be obtainable for the main crop at a later date.

Sweet potato cuttings will now be obtainable, and attention is directed to this valuable crop, which will thrive over a much greater range of climatic and soil conditions than the English potato. There is scarcely a farm throughout the State which would not benefit from a patch of sweet potatoes, for either culinary or stock-feeding. They are not always profitable as a market proposition, but considerable improvement in this direction is possible if well-graded tubers of suitable cooking varieties only are marketed.

SUNDAY MORNING—THE COUNTRYMAN'S SESSION.

Radio Service to Farmers.

Every Sunday morning at a quarter to nine o'clock a bright, topical, and entertaining programme of information on rural subjects is broadcast from National and Regional Radio Stations. (By arrangement with the Australian Broadcasting Commission.)

Farmers are recommended to tune in to—
4QR (Brisbane), 4RK (Rockhampton), or 4QN (Townsville).

EVERY SUNDAY at 8.45 a.m.

Weather and market reports and a wide variety of farm topics.

Orchard Notes

SEPTEMBER.

THE COASTAL DISTRICTS.

IN the North Coast and Gayndah districts most of the citrus crops have been harvested, with, perhaps, the exception of Valencia Lates. Orchard work this month includes pruning, cultivation, fertilizing, and spraying. Some trees may be showing signs of impaired vigour, and these will require a severe pruning, both in thinning and shortening back, removing superfluous growths and diseased and weakly woods. Healthy and vigorous orange trees will require little attention beyond the removal of crowded lateral growths.

Mandarins will need special treatment, particularly Glen Retreats and Scarlets. These varieties usually produce a profusion of branches, and as the trees mature the growths harden and the fruit-bearing shoots make short, weakly growths, which usually result in an over-production of small fruits and a weakening of the trees. This is noticeable particularly in the case of the former variety, for which the annual pruning should consist of a heavy thinning and shortening back. Mature mandarin trees require attention towards assisting them to produce new and vigorous fruit-bearing growths.

Unprofitable trees should receive attention and be prepared for top-working. They may be headed back to three or four main arms radiating from the stem and whitewashed to prevent bark scald. Such trees may be grafted or later budded when suitable growths have matured.

Before working up the soil, fertilizing should receive attention. The spring application should carry a high percentage of nitrogen.

In the warmer districts, which are free from frosts, plantings of young trees may be made. Serious consideration should be given only to the selection of commercial varieties and, having due regard for local conditions, selections may be made from the following varieties:—Washington, Navel, Joppa, Siletta, Valencia Late, Beauty of Glen Retreat, Emperor, Scarlet, Solid Scarlet, Marsh Seedless or Thompson grapefruit, and Villa Franca, Lisbon, and Genoa lemons.

Where melanose and black spot are present in orchards, preparations for control measures should be made and Bordeaux sprays applied at the correct times.

Most citrus trees would benefit considerably by the application of a strong lime-sulphur wash, 1-18.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

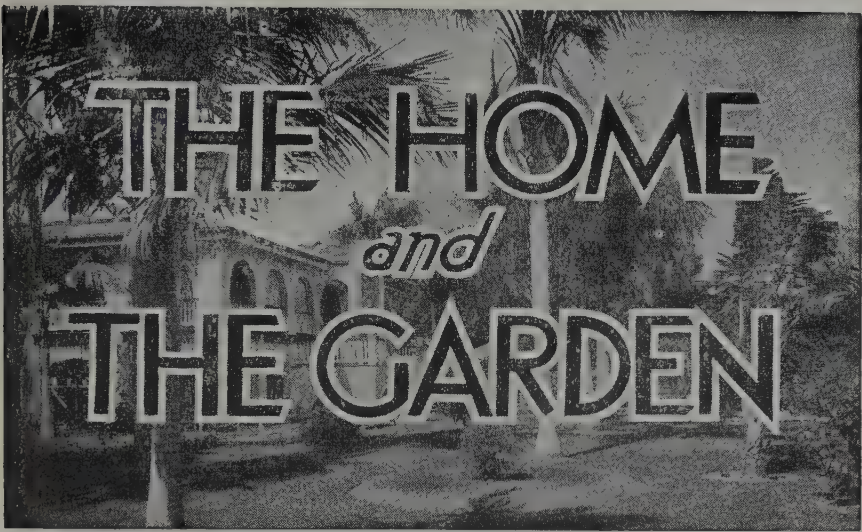
BLACK aphis should be attacked wherever it makes its appearance by spraying with a tobacco wash, such as black-leaf forty. If these very destructive insects are kept well under control, the young growth of flowers, leaves, wood, and fruit will have a chance to develop.

The working-over of undesirable varieties of fruit trees may be continued. The pruning of grape vines should be done during this month, delaying the work as long as it is safe to do so, as the later the vines are pruned the less chance there is of their young growth being killed by late frosts. Keep the orchards well worked and free from weeds of all kinds, as the latter not only deplete the soil of moisture, but also act as a harbourage for many serious pests, such as the Rutherglen bug.

New vineyards can be set out, and, in order to destroy any fungus spores that may be attached to the cuttings, it is a good plan to dip them in Bordeaux mixture before planting. The land for vines should be well and deeply worked, and the cutting should be planted with one eye only out of the ground and one eye at or near the surface of the ground.

In the warmer parts which are suitable for the growth of citrus fruits, the land must be kept well cultivated, and if the trees need irrigating they should be given a good soaking, to be followed by cultivation as soon as the land will carry a horse without packing.

Fruit fly should be systematically fought, as it will probably make its appearance in late citrus fruits and loquats; and if this swarm of flies is destroyed, there will be every chance of the early crops of plums, peaches, and apricots escaping without much loss.



Our Babies.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

THE EXPECTANT MOTHER.

HEALTHY MOTHERHOOD.

TO be the strong, healthy, happy mother of a strong, healthy, happy child should be the ambition of every woman. There are many such women living to-day, but there would be many more if every expectant mother realised the importance of keeping herself fit. In order to do this, she needs to exercise a little thought and be prepared to take a little trouble to learn how to care for her own health and, by so doing, the health of her developing infant.

Ante-natal Care.

The care given to the expectant mother is known as ante-natal care. The want of ante-natal care may lead to a mother being seriously ill and possibly an invalid after her confinement, just when health and strength are most needed for the sake of herself and her family. Most women are never healthier or happier than during pregnancy. For some it is a time of discomfort, which may be much relieved by ante-natal care.

Medical Supervision.

The wisest plan that an expectant mother can adopt is to put herself at once under the care of a doctor or to pay a visit to the nearest ante-natal clinc. There are at least two reasons why she should do this. One is for her own comfort, many of the milder ailments of the expectant mother being easily corrected or prevented by simple medical or nursing means. The other is for her safety and that of the expected child. One of the great advantages that she will derive from obtaining skilled advice in good time will be peace of mind. She will know what

she may safely do, and she will be able to do it quietly and without worry. She will feel that someone who knows is sharing her responsibility, and that she is doing what is best for her unborn infant.

An expectant mother should welcome and not avoid a thorough medical examination for the prevention of any possible dangers to herself and her expected baby. In this way she will be doing her best to ensure an easy and safe confinement, to preserve her own health and the health of her baby.

Care of the Teeth, &c.

Her teeth should be carefully examined, for no one with defective teeth can digest food satisfactorily. Apart from this, they may produce poisons which are liable to be absorbed into the body and to cause ill-health. Every woman should realise the value of having her urine tested and her blood pressure taken at regular intervals.

Diet.

It is most important that the expectant mother should eat food of the right kind.

The baby is entirely dependent on his mother for his health and nourishment during the nine months before he is born, and for some time after his birth. Therefore, she must eat the foods which will provide his requirements, and which at the same time will nourish and agree with her.

For instance, the baby from a very early stage needs lime and phosphorus to form bones and teeth. If the mother does not take food containing sufficient of these minerals, he will draw on the stores of lime and phosphorus in her bones and teeth. Even so, he may go short, and the result will be that the baby will be born with soft bones and his teeth will decay early. The mother will suffer, too, for her teeth will be liable to decay and she may complain of cramps.

The food taken by the expectant mother must (1) be sufficient in amount, (2) include minerals adequate for the nutrition of herself and her baby, (3) contain vitamins or accessory food factors in sufficient quantity.

What she needs is a balanced diet—that is, one containing suitable quantities of the various food substances.

Three meals a day are sufficient and should include—

Milk.—1½ to 2 pints. If fresh milk cannot be obtained, full-cream dried milk may be used. It may be flavoured with cocoa. Some will be taken with porridge or in junket or milk puddings.

One egg.

Cheese.—1 oz.

Butter.—1½ to 2 oz. If there is a deficiency of butter, fresh beef dripping may be used.

Meat should be taken in moderation and should include poultry, liver, and fish. Liver and fish are valuable and should be eaten once or twice a week. Tinned salmon and herring should be included.

Vegetables.—A liberal allowance of vegetables, both raw and cooked, is necessary. Raw vegetables as salads should include lettuce, tomatoes, celery, scraped carrot, finely-cut raw cabbage heart, and sweet peppers. Many of these can be grown in a small vegetable patch. Sweet pepper

is commonly known as sweet capsicum or chili, and is distinguished by its mild and pleasant flavour, in contrast to the burning, acrid flavour of the ordinary chili. The sweet pepper is easily grown, takes up very little room, and is a valuable food. Potatoes should be cooked in their jackets and eaten every day. Other wholesome vegetables are spinach, silver beet, Chinese cabbage, French beans, peas, turnips, turnip tops (as a green cooked vegetable), swede turnips, and sweet potatoes.

Post-natal Care.

It is well known that the new baby is cared for at the clinics, but it is not generally realised that the care of the mother is undertaken at the ante-natal clinics after the birth of the child. The mother should present herself to her doctor or the clinic about six weeks after her confinement, in order to be examined to see that her organs are again in their right position. So frequently simple treatment prescribed by her doctor can prevent small troubles developing into big ones which may in the end need operation to restore her to comfort and good health.

The Expectant Father.

First of all, the husband must try to realise that, because his wife is going to have a baby, she must not be treated as an invalid, but must be treated so as to fit her for the task which lies before her. This means that she will require to be properly fed, to have regular exercise, recreation, sleep, fresh air, sunshine, and freedom from worry—in fact, to have everything a normal healthy woman requires.

Women who have previously been accustomed to leading active out-of-door lives should modify their habits sufficiently to avoid over-exertion and fatigue. Those who have been accustomed to leading quiet indoor lives will find it wise to begin their open-air exercise gradually.

The husband should encourage his wife to attend the ante-natal clinic or her own doctor regularly from the earliest months, and to carry out the instructions given her. Actual treatment advised is usually very little and aims at preventing disease, discomfort and pain, and keeping her comfortable.

Until recently ante-natal clinics in connection with the Maternal and Child Welfare Service, provided by the Department of Health and Home Affairs, were held in Brisbane at the Woolloongabba Baby Clinic on Monday evenings and at the Fortitude Valley Baby Clinic on Thursday evenings. These are under the supervision of a woman doctor.

Through an extension of this service, ante-natal clinics have been established at the following centres:—

		In each month.
Caboolture ..	School of Arts ..	First and third Tuesday.
West End ..	Baby Clinic ..	Second and fourth Tuesday.
Corinda ..	Shire Hall ..	First and third Wednesday.
Yeronga ..	Progress Hall ..	Second and fourth Wednesday.
Enoggera ..	Memorial Hall ..	First and third Thursday.
Herschel street	Baby Clinic ..	Second and fourth Thursday.
Morningside ..	School of Arts ..	First and third Friday.
Nundah ..	Baby Clinic ..	Second and fourth Friday.

Hours.—2 p.m. to 4.30 p.m., with the exception of Caboolture, which is from 12.45 p.m. to 3 p.m.

At each of these clinics a sister fully qualified and having special experience in ante-natal work will be in attendance.

It is expected that mothers living in these districts will be glad to take full advantage of this service, which has been established entirely for their benefit in order to keep guard over their health and fit them for the task which lies before them.

For further information call at the ante-natal clinic or write to the Sister in Charge, Ante-natal Clinic, Alfred street, Fortitude Valley, Brisbane.

CHILDREN'S LIBRARIES—EXAMPLES IN VICTORIA.

Recent activity suggests a greatly awakened interest in the children's library movement in Victoria. By purely citizen effort libraries for children have been established in Heidelberg and Geelong, to name only two centres. In each case the library is controlled and operated by voluntary workers; in each instance also civic support is lacking. These two libraries are purely book exchange rooms, no facility being available for other library functions, such as reading circles and lectures. A commendable feature of their work, however, is the distribution of books to schools in their areas. The only Victorian children's library effectively performing its function is that at Prahran, which for over twenty years has been serving the library needs of the children of Prahran, both as regards books, guidance for children in reading, story hours, and the like. The Prahran library is fortunate in the generous support given by the local municipal council, and in the trained personnel operating it. Hawthorn and Footscray councils also give splendid support to children's libraries. The work done by these municipalities is an example in civic realisation of the cultural value of the library that could well be followed by every other municipality in the metropolitan area, and many country municipalities. As yet, however, their library conscience has not been awakened. For this the citizens are possibly largely to blame, as they, too, fail to realise the advantages of properly equipped children's libraries.

—*The Leader*, Melbourne.

TREES.

They stand to shade,
To purify:
To shelter all
Who would draw nigh.
To bid the birds
And cattle come
And rest awhile
Within their home.
I'm glad I know
Something of these:
That rare companionship
Of trees.

—(*Author unknown.*)

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of July in the Agricultural Districts, together with Total Rainfall during 1939 and 1938, for Comparison.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	July.	No. of years' records.	July, 1939.	July, 1938.
North Coast.	In.		In.	In.
Atherton	1·14	38	0·91	2·85
Cairns	1·58	57	0·53	2·03
Cardwell	1·39	67	0·47	2·66
Cooktown	0·96	63	0·58	0·71
Herberton	0·90	53	0·32	2·37
Ingham	1·69	47	1·33	4·58
Innisfail	4·80	58	3·78	8·17
Mossman Mill	1·34	26	..	2·20
Townsville	0·66	68	0·07	3·68
Central Coast.				
Ayr	0·72	52	..	3·30
Bowen	0·94	68	0·10	2·61
Charters Towers	0·66	57	0·26	1·91
Mackay P.O.	1·69	68	0·32	3·03
Mackay Sugar Experiment Station	1·50	42	0·15	2·43
Proserpine	1·58	36	1·85	2·68
St. Lawrence	1·38	68	0·20	1·68
South Coast.				
Biggenden	1·41	40	2·64	3·24
Bundaberg	1·88	56	1·47	4·29
Brisbane	2·21	87	2·00	1·43
Caboolture	2·15	52	2·80	2·04
Childers	1·73	44	2·18	2·98
Crohamhurst	2·95	46	3·80	3·21
Esk	1·97	52	2·37	2·86
South Coast—contd.	In.		In.	In.
Gatton College	1·40	40	..	1·32
Gayndah	1·48	68	2·75	2·67
Gympie	2·09	69	2·81	2·44
Kilkivan	1·60	60	2·00	2·35
Maryborough	1·95	68	2·89	3·98
Nambour	2·70	43	3·41	3·99
Nanango	1·68	57	1·81	3·39
Rockhampton	1·77	68	0·45	2·05
Woodford	2·34	52	2·37	2·64
Central Highlands.				
Clermont	1·06	68	1·42	2·80
Gindie	1·10	40	1·33	0·95
Springsure	1·21	70	1·20	0·71
Darling Downs.				
Dalby	1·73	69	2·17	2·19
Emu Vale	1·59	43	1·94	1·50
Hermitage	1·69	33	..	0·88
Jimbour	1·53	51	1·48	1·91
Miles	1·64	54	1·66	1·47
Stanthorpe	2·03	66	1·50	1·74
Toowoomba	2·09	67	2·14	2·30
Warwick	1·83	74	1·50	1·34
Maranoa.				
Bungeworgorai	1·37	25	..	0·45
Roma	1·45	65	1·64	0·34

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JUNE, 1939.

Compiled from Telegraphic Reports.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·96	79	67	82	29	60	20	405	6
Herberton	..	72	54	80	30	43	8	354	7
Rockhampton	30·06	67	53	81	30	43	22, 23	267	7
Brisbane	30·07	69	52	76	26	43	25	244	5
Darling Downs.									
Dalby	30·14	66	43	73	12, 15	33	10, 11, 24, 25	310	8
Stanthorpe	..	59	36	71	11	22	10	233	8
Toowoomba	..	62	47	68	26, 29	33	10	334	7
Mid-Interior.									
Georgetown	30·00	82	54	90	27	41	7	276	3
Longreach	30·08	73	48	84	29	39	3, 7, 23	104	3
Mitchell	30·10	67	40	77	4	30	7, 11	64	4
Western.									
Burketown	30·00	80	58	89	27	47	6	163	2
Boulia	30·10	71	49	82	28	41	3, 4, 5, 7	192	4
Thargomindah	30·06	66	46	75	25	38	6	62	4

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	August, 1939.		September, 1939.		MOONRISE. Aug. 1939.	MOONRISE. Sept., 1939.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	6·35	5·21	6·7	5·37	6·17	7·37
2	6·34	5·22	6·6	5·37	7·6	8·30
3	6·33	5·23	6·5	5·38	7·54	9·23
4	6·33	5·24	6·4	5·38	8·50	10·16
5	6·32	5 25	6·3	5·39	9·39	11·11
6	6·31	5·26	6·2	5·39	10·33	..
						a.m.
7	6·31	5·26	6·0	5·40	11·28	12·5
8	6·30	5·27	5·59	5·40	a.m.	1·4
9	6·29	5·27	5·58	5·41	12·23	2·0
10	6·28	5·28	5·57	5·41	1·19	2·53
11	6·28	5 28	5·56	5·42	2·20	3·43
12	6·27	5·29	5·54	5·42	3·17	4·29
13	6·26	5·29	5·53	5·43	4·13	5·16
14	6·25	5·30	5·52	5·43	5·6	6·2
15	6·24	5·30	5·50	5·44	5·57	6·46
16	6·23	5·31	5·49	5·44	6·43	7·30
17	6·22	5·31	5·48	5·45	7·27	8·15
18	6·21	5·32	5·47	5·45	8·11	9·2
19	6·20	5·33	5·45	5·45	8·55	9·50
20	6·19	5·33	5·44	5·46	9·38	10·42
21	6·18	5·33	5·43	5·46	10·21	11·33
						p.m.
22	6·18	5·34	5·42	5·47	11·8	12·26
23	6·17	5·34	5·41	5·47	11·58	1·17
					p.m.	
24	6·16	5·34	5·40	5·47	12·49	2·10
25	6·15	5·35	5·39	5·48	1·38	3·0
26	6·14	5·35	5·38	5·48	2·31	3·51
27	6 13	5·35	5·37	5·49	3·22	4·37
28	6·12	5·36	5·36	5·49	4·12	5·32
29	6·11	5·36	5·35	5·50	5·4	6·24
30	6·10	5·37	5·34	5·50	5·55	7·18
31	6·9	5·37			6·46	

Phases of the Moon, Occultations, &c.

8th Aug., ☾ Last Quarter 7 18 p.m.
15th „ ● New Moon 1 53 p.m.
22nd „ ☽ First Quarter 7 21 a.m.
30th „ ○ Full Moon 8 9 a.m.

Apogee, 2nd August, at 10 a.m.
Perigee, 15th August, at 6 p.m.
Apogee, 29th August, at 1 p.m.

On the 10th, Mercury will be in line between the Sun and Earth, setting 10 minutes after the Sun. Mounting higher night after night, it will attain its greatest altitude on the 28th, which, however, will be only 18 degrees above the horizon, three times the length of the Southern Cross.

Mars and the Moon, rising in daylight, will accompany each other on the 26th. Technically, a "conjunction" will occur at midnight, when Moon and planet are at the same right ascension or celestial longitude.

Mercury rises at 7.15 a.m., 40 minutes after the Sun, and sets at 6.33 p.m., 1 hour 12 minutes after it, on the 1st; on the 15th it rises at 5.47 a.m., 37 minutes before the Sun, and sets at 4.39 p.m., 31 minutes after it.

Venus rises at 6.1 a.m., 34 minutes before the Sun, and sets at 4.35 p.m., 46 minutes before it, on the 1st; on the 15th it rises at 6.7 a.m., 17 minutes before the Sun, and sets at 5.1 p.m., 29 minutes after it.

Mars rises at 4.18 p.m., and sets at 6.32 a.m., on the 1st; on the 15th it rises at 3.10 p.m., and sets at 5.16 a.m.

Jupiter rises at 9.54 p.m., and sets at 9.50 a.m., on the 1st; on the 15th it rises at 8.55 p.m., and sets at 8.55 a.m.

Saturn rises at 11.35 p.m., and sets at 10.57 a.m., on the 1st; on the 15th it rises at 10.38 p.m., and sets at 10.6 a.m.

Of our glorious morning stars, Venus and Jupiter, which for so long have filled all lovers of stars with admiration, Jupiter has become an evening star and Venus, near the Sun, is invisible. On 5th September, Venus will be in line with the Sun and Earth, setting a few minutes after our luminary, so that we can now look forward to the sudden appearance of Hesperus, perhaps in the afterglow of the Sun.

News came to hand that a third-magnitude comet was visible to the naked eye in Arizona, U.S.A., last April. The discovery was made at Oslo Observatory, Norway.

7th Sept. ☾ Last Quarter 6 24 a.m.
13th „ ● New Moon 9 22 p.m.
20th „ ☽ First Quarter 8 34 p.m.
29th „ ○ Full Moon 12 27 a.m.

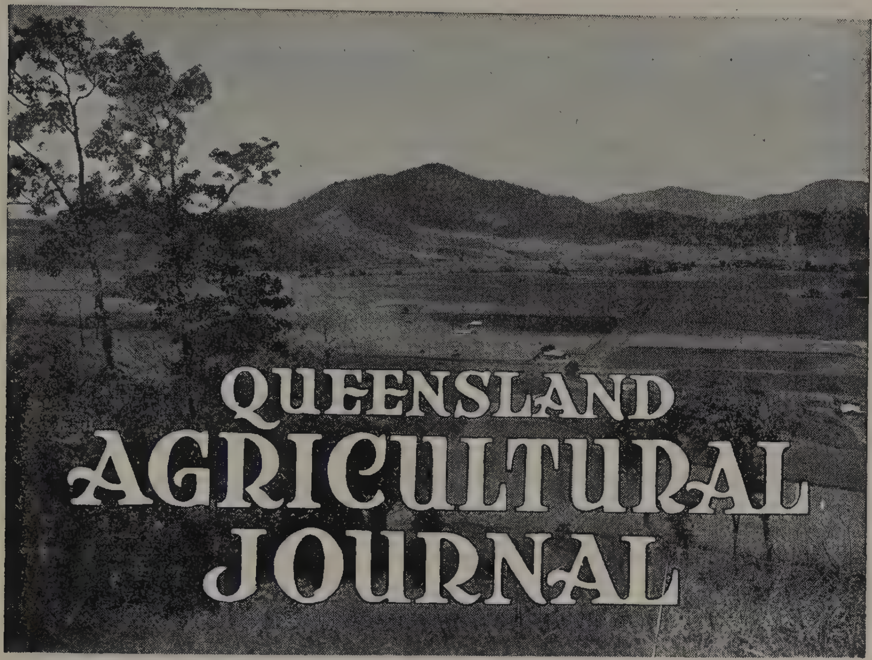
Perigee, 13th September, at 4.0 a.m.
Apogee, 25th September, at 7.0 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.



Vol. LII. 1 SEPTEMBER, 1939 Part 3

Event and Comment

The Meaning of Democracy.

AT a great public gathering at Mackay to commemorate his jubilee as representative for the district in the Queensland Parliament, the Premier, the Hon. W. Forgan Smith, LL.D., made a notable speech on national wellbeing as based on an educated democracy. His address was preceded by a presentation to him by the Mayor of Mackay (Alderman G. Moody) of a cheque for £1,000, and a beautiful inlaid table of Queensland woods, as tokens of public appreciation of his services in the Legislative Assembly as member, as former Minister for Public Works and Minister for Agriculture and Stock, and as Premier of the State for more than seven years. Thanking the people whom he had represented continuously for twenty-five years for their magnificent gesture of goodwill, the Premier said that being a member of Parliament in a democracy was a high honor and privilege and also a great responsibility, particularly in a State like Queensland, which was only at the beginning of its development. A great deal had been done since Queensland had been established as a State and a great deal remained to be done. The generations to follow would have their own problems and pioneering to do. It was the duty of the present generation to preserve all that was good in the past and improve upon it, do its share of developmental work, and pass it on to the succeeding generation. They were living probably in the most critical period in the world's

history, when things which were taken as permanent a few years ago, no longer form a permanent part of the life of the people. There were two ideas in conflict, but he believed that social progress could be accomplished only by conference, investigation, and discussion. Again there was the conception of force that all things must go to the strong, which was the cause of world disturbance. He knew that there was the law of the survival of the fittest, but he also knew that in all forms of human life there was the principle of mutual aid and that principle went to form organised society as they knew it and as their forefathers fought for it. They would be false to the people who were pioneers and would be recreant to the best traditions of their race if they did not acquit themselves like men and be strong to resist and struggle to preserve all that was best, highest, and noblest in their lives.

The Premier added that all good things in life came from the upsurge that was in the human heart and the human soul which found expression in the determination to achieve liberty, which had not been handed down like the table of the law on Mt. Sinai. He felt sure that the people of Australia and the people who made up the great British Commonwealth of Nations would be true to those principles of liberty which he had tried to outline. If they preserved their morale no matter what trouble might be in store they would meet it with courage and determination. Nothing could ever live permanently that was based on force, for what was won by the sword to-day would be taken by the sword some other day.

It had fallen to his lot, he said, to hold high office during a period when duty was more difficult than it had been in the past. They had their black moments of deep despair when they appeared to be looking into an inpenetrable haze and did not know which road to take. In a democracy it was necessary always to be able to persuade the majority of the people as to what was required and there were those who sought to retard development—men who tried to knock down rather than build up. It was always easier to destroy than build, but he had the consolation that the people of Mackay had given him their confidence. That was not given lightly or accepted lightly and he felt that he had done the best he could under the circumstances for the people he represented. They had to remember that by far the greatest percentage of the people desired honest government and the greatest good for the greatest number.

The Premier said he wished to thank the Mayor, and those associated with him, for the testimonial. He appreciated to the full the kindliness of the sentiment that was behind it all. Goodwill was something that could not be bought and was something that could not be measured in mathematical terms. It was a wonderful thing and one of the principles that enabled civilisation to go on and become better each year. "This gift," he added, "will enable me to do something that I have wanted to do for a long time—that is something specfic for education here in Mackay and district. I have been associated with the development of education in Queensland. We have a high standard of education in Queensland. We have a standard of education equal to anything in the Commonwealth, and we are improving it each year, giving assistance from the kindergarten right to the university. Many splendid students have gone through our schools and university. There is nothing that Queensland boys and girls cannot do if they are trained to do it. I have been privileged also to be associated with the establish-

ment of no less than seven new faculties in the University of Queensland, and the Government, in conjunction with the Senate, is building a splendid new university at St. Lucia, which will be in keeping with the honor and dignity of the people of Queensland, and will serve not only the present generation, but those of the future. I will be able with this £1000 to help some Mackay boy or girl, or both, to get a secondary education, which they might not otherwise be able to get. The money, therefore, will be used for a bursary, and will be made available to children whose parents have not an income in excess of £300 net per annum. "There is nothing to be compared with the fostering of the youth of the community. They are the future citizens, and no memorial could please me better than a memorial to help some boy or girl in their life."

It would be a very cherished thing, the Premier further remarked, to feel that such a use for such a very generous gift would be for the good of boys and girls perhaps yet unborn.

"Australia is capable of being a great country," he said, "it is a great country now, and you ought to thank God for the privilege of being Australian citizens." He added that there came to his mind the lines of Robert Burns, with which he would close: "And I'll remember thee, Glencairn, and all that thou hast done for me."

Farm Costing.

AT the Annual Conference of the Council of Agriculture the Minister for Agriculture and Stock, Hon. F. W. Bulcock, made particular reference to observations he had made during his recent mission abroad on methods of farm costing and recording being applied in some of the countries visited.

Economic pressure, he said, was becoming so acute in the agricultural industries that primary producers practically the world over were being forced to adopt some system of recording which would disclose the costs involved in the varying methods and practices applied to the many ramifications involved in primary production. He had made a selection of what he considered to be the best of these methods, and expressed the confirmed opinion that, from the information which he could make available, a system of farm costing could be instituted in this State which, if efficiently administered, would be of incalculable value to the rural industries.

Such an undertaking, he considered, should be the function of some organisation other than governmental, and he felt that the Council of Agriculture was the most appropriate body for the purpose. It would require, however, the close co-operation of the various pool boards which, he felt sure, would be readily forthcoming.

He pointed out that in one area in America 87 per cent. of the producers are participating in the work of the Farm Costing Bureau and said it was amazing to note the conclusions arrived at and the efficiency of the methods used as a result of the information obtained by this system.

The Council unanimously agreed to the following resolution:—"That the Executive be requested to devise, in co-operation with the Commodity Boards, a system of farm costing in order to determine economic costs in Queensland."

The Parasitic Worms of Sheep.

F. H. S. ROBERTS, D.Sc., Entomologist and Parasitologist, Animal Health Station, Yeerongpilly.

Department of Agriculture and Stock, Queensland.

NO animal suffers more severely from worms than the sheep, a feature associated with its close grazing habits and with modern methods of sheep-raising. In Queensland, worm diseases in sheep become of primary importance as diseases caused by other organisms, such as bacteria, &c., appear comparatively uncommon. In fact, it may be said that in this State, were it not for drought, worms, and blowflies, losses in the sheep industry would indeed be small.

Losses from worms are not to be measured solely by mortalities. Such ill-effects as failure to grow and fatten, loss of condition, and decreased wool values must also be taken into consideration. These, not being at all spectacular, are too often inclined to be overlooked.

Most sheep in Queensland harbour worms. Even in the dry western areas sheep are not entirely free from these parasites. It is, however, only when the annual rainfall exceeds about 20 inches that worms become serious. Moisture is essential for the development of larval worms in the pastures and consequently outbreaks are dependent chiefly upon the rainfall, and the higher the rainfall the more prevelant do outbreaks become.

The successful sheep farmer realises the wisdom of keeping his flocks as healthy as possible. Where worm diseases occur, this can be accomplished only by a knowledge of the various kinds of worms that infest the sheep and of the steps to be taken to control them.

HOW SHEEP BECOME INFESTED WITH WORMS. (Plate 104.)

There are a number of different kinds of worms which infest sheep. Some of these live in the fourth stomach, others in the small intestine, others in the large intestine, and others again in the lungs. Each kind has its own favourite place in the body of the sheep and is rarely seen anywhere else.

Worms do not breed inside the sheep. The only way in which sheep can become infested is by picking up the tiny larval stages of the worms, which are present on the grass and in soil and water in the pastures These larval worms hatch from eggs laid by worms in the sheep and passed out of the body in the droppings.

In the case of some worms such as tapeworms, the worm eggs must be eaten by another kind of animal, such as a mite. When the mite is swallowed by the sheep, the tapeworm larvæ in the mite are set free and grow to the adult stage in the sheep's intestine. The mite is known as an intermediate host. The sheep itself is an intermediate host for several tapeworms which infest the dog.

HOW TO RECOGNISE AN OUTBREAK OF WORMS.

A sheep suffering from worms always exhibits certain symptoms. These are discussed later in the sections dealing with the various species of worms. The presence or absence of these symptoms forms a fairly practical guide to the degree of infestation in a flock. Where a heavy

infestation is indicated, it is always wise to kill and examine two sheep from the flock. Such an examination will confirm or otherwise the diagnosis of worm disease and, at the same time, will show which species of worm is responsible. This is a very important point, as it indicates which treatment is to be used.

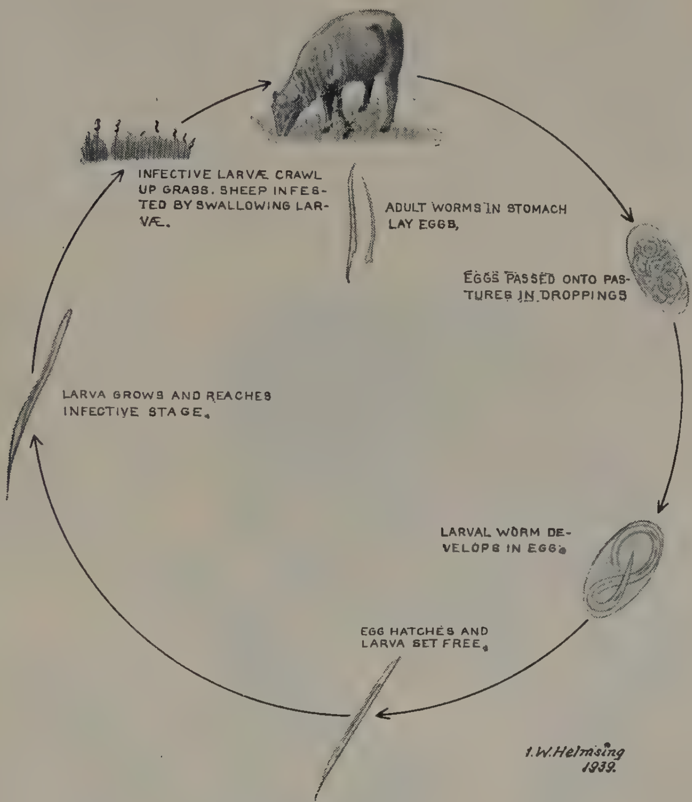


Plate 104.

HOW SHEEP BECOME INFESTED WITH ROUNDWORMS.

1. Overstocking.
2. Damp, marshy pastures.
3. Shallow stagnant pools.
4. Continuous dull showery weather.
5. Regular drenching not used.
6. Permanent pastures.
7. Poor nutrition.

It is also advisable to examine for worms any sheep that dies or is killed, for this will give some idea of the degree of infestation existing in a flock.

In making an examination of a sheep, it must be remembered that the presence of a few worms is of little consequence. It is only when worms are numerous that they become serious. It has been estimated that in young sheep, for example, the first signs of ill-health are seen only when 500 or more large stomach worms are present, or 100 or more nodule worms, or 10,000 or more hair worms. Furthermore, when worms

are serious there are usually very marked unhealthy changes in certain organs of the body, in the flesh and in the blood. Thus, worm disease may be recognised, firstly, by the symptoms, secondly, by finding very large numbers of worms, and, thirdly, by certain unhealthy changes in the organs of the body, &c. These three factors should be considered together before coming to any decision.

HOW TO EXAMINE A SHEEP FOR WORMS.

The animal selected for examination is killed and laid on its back. The four legs are partly dismembered from the body and laid back on the ground. This gets the legs out of the way and at the same time keeps the carcase in position. The abdomen is then slit open straight up the mid line, cutting also through the breast bone. The skin is then cut sideways so that it can be laid aside, exposing the internal organs. The stomach of the sheep is very large, filling most of the left half of the abdominal cavity and part of the right half (Plate 105). It is divided

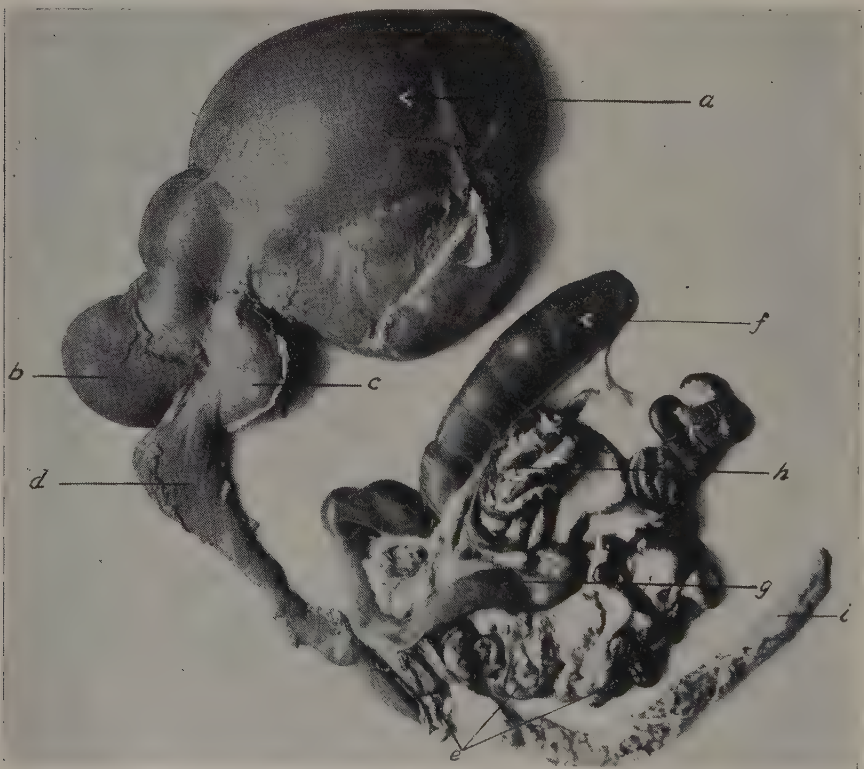


Plate 105.

DIGESTIVE TRACT OF A SHEEP.—(*a*) paunch; (*b*) honeycomb; (*c*) bible; (*d*) fourth stomach; (*e*) small intestine; (*f*) cæcum; (*g*) large intestine; (*h*) "crown" of large intestine; (*i*) rectum.

into four portions—(1) the very large rumen or paunch, (2) the smaller reticulum or honeycomb, (3) the rounded omasum or bible, and (4) the elongate abomasum or fourth stomach. The fourth stomach is where the large stomach worm is found. The other three stomachs are of little

importance as worms rarely occur in any of these. The fourth stomach runs into the small intestine, which attains a length of up to 80 feet. The small intestine continues into the large intestine, which in one direction ends blindly in the cæcum and in the other continues for up to about 15 feet, and is much coiled, to end in the anus. The large intestine and fourth stomach should be slit open and examined carefully. Worms in the fourth stomach and large intestine are easily seen, but for the small worms in the small intestine the following procedure should be adopted:—The small intestine is freed from the webbing that holds it (the mesentery) for a distance of about 25 feet. It is then pulled between the thumb and forefinger, which are held as tightly as possible, and the contents expressed into a bucket of water. These are allowed to settle for about fifteen minutes and the water is then carefully decanted. Further water is added and the operation repeated until the water remains clear. The sediment is then examined bit by bit in a glass dish held over a black background. This is the only way by which some idea can be secured of the number of hair worms present. The first 10 feet or so of the small intestine should then be slit open and examined for any hookworms. These adhere very firmly to the intestine wall and the above method of examination may not remove them all. The lungs should then be cut out and their air tubes slit open and examined for lung worms. Throughout the examination a careful watch should be kept for any unhealthy changes in the various organs.

THE CONTROL OF WORM DISEASES.

The control of worms does not aim at their complete eradication, which under the normal conditions of sheep-raising is quite impossible, but rather at keeping their numbers below the point at which they become harmful. The measures which may be employed to attain this object fall under two headings—(1) preventive measures, or measures which can be applied to prevent infestation, and (2) treatment, or measures by which the worms are removed from the sheep.

Preventive Measures.

The principles which are advised as being of value in preventing infestation have been evolved from a knowledge of the life histories of the parasites, of certain factors which influence the development of the eggs and larvæ in the pastures, and of factors which affect the resistance of the sheep to infestation. In the light of this knowledge then the following principles of prevention may be laid down:—

(1) *Avoid overstocking.*—Overstocking is probably responsible for more outbreaks than any other factor. The dangers of overstocking will be realised when it is pointed out that two animals on any particular area may pick up four times as many worms as one animal; three may pick up nine times as many, ten may pick up 100 times as many, and so on. Overstocking also leads to close grazing by the sheep. As most of the worm larvæ are to be found sheltering in the grasses close to the ground, the chances of infestation are thereby greatly increased.

(2) *Avoid damp marshy pastures.*—Moisture is necessary for the development of the eggs and larvæ outside the sheep and also for their survival.

(3) *Rotate the pastures.*—Where practicable, rotation of pastures is an excellent system of prevention. The animals are kept moving from

pasture to pasture, so that they do not remain on any one pasture sufficiently long to grossly contaminate it. They move each time on to a pasture which has been spelled or fired. A pasture spelled from sheep for about three months will lose most of its infection. Pastures which are being spelled may be used for horses.

(4) *Water from troughs.*—This prevents animals drinking from shallow stagnant pools and other such places which are favourite haunts of worm larvæ. Such places also become danger spots in dry weather as the sheep concentrate on the green feed growing there, thus leading to heavy overstocking on small areas. The formation of moist areas around drinking troughs should be guarded against for the same reasons.

(5) *Periodic firing of the pastures is advisable.*—Whilst firing cannot be depended upon to cleanse a pasture of larvæ, for many of these sheltering in the bases of the grass are protected from the fire, it must decrease their numbers to an appreciable extent. A burnt pasture is a very useful substitute for a spelled pasture. Furthermore, the green feed that comes after burning is very nutritious.

(6) *Nutrition.*—This is a very important factor in the control of worm diseases. It has been shown very definitely that sheep on a highly nutritive pasture can withstand much heavier infestations than sheep on poor pastures. It is therefore a great advantage to be able to provide the sheep with nutritious pastures, particularly in dry times. This may be done by laying down lucerne, improved grasses, oats, &c., or by top-dressing with superphosphate. Otherwise the animals can be hand fed with such economical foods as wheat, maize, oats, lucerne chaff, &c. Improved pastures must be grazed with care. Although the carrying capacity of improved pastures in relation to worm infestation is much higher than on natural pastures, a limit to this is eventually reached, and if exceeded serious losses may follow. Animals on improved pasture should not be permitted to graze backwards and forwards over the one area. They should be kept moving in the one direction.

The provision of a good lick assists sheep to remain healthy and thus increases their resistance to infestation. A good type of lick containing most of the essential elements is—

Bonemeal	65
Salt	30
Limonite	5

(7) *Protection of very susceptible sheep.*—Young sheep up to about 18-24 months old, pregnant ewes, and ewes with lambs are the most susceptible classes of sheep. These should receive special attention when preventive measures are being considered. Sheep of any age brought into wormy districts from areas where worms are few are also very susceptible.

Treatment.

Where an effective treatment is available, it becomes the main line of defence. By a systematic programme of treatment infestations can be controlled and outbreaks greatly diminished. Preventive measures, however, must not be neglected, even when treatment is highly effective. Where treatment is not satisfactory, control relies chiefly, and in some cases almost entirely, on prevention. Where treatment is indicated, it should be applied to every member of the flock and not confined to those sheep which appear infested.

Drenching.

All drenches used for the removal of worms are poisons. If the following principles are adhered to, however, drenching can be made as safe as humanly possible:—

(1) Measure out or weigh out the various ingredients very carefully. Do not attempt to guess the various quantities.

(2) To make sure no mistake has been made in mixing a drench, treat several sheep a day or so before the rest of the flock, and watch them carefully for any serious after-effects.

(3) Give no more than the recommended dose. The too frequent practice of giving a double dose to very wormy sheep is decidedly dangerous.

(4) Drench carefully and slowly and handle the animals quietly. Only by observing these principles will losses be avoided from drenches entering the lungs and from other ill-effects of excitement and nervousness following rough handling. Furthermore, in hurried drenching portion of the drench may be lost, and it is from the full dose only that efficient results can be expected.

(5) The above points should be specially borne in mind when treating very weak sheep. Such sheep should also receive a reduced dose (about three-quarters of the recommended dose). It is better to remove worms from weak sheep by several reduced doses than to give a full dose and risk killing the animal.

(6) The art in drenching is to get the sheep to swallow a full dose and to keep it out of the lungs. Drench only when the animal is standing on all fours. Insert the nozzle of the syringe from the side of the mouth, over the back of the tongue and pointing towards the throat. Depress the plunger slowly and evenly so that the fluid is not squirted violent into the mouth, particularly in the case of the bulkier drenches. While drenching, do not force the animal's head back; keep it in a horizontal position. Allow the animal time to swallow and do try to assist swallowing by such practices as tickling the throat and holding the hand over the nostrils.

(7) Drench in the cool of the morning or evening.

(8) Starvation before drenching is now considered unnecessary, though it is wise to keep the animals from water for an hour or two after treatment.

WORMS INFESTING SHEEP.

The various worms found in sheep are either flukes, tapeworms, or roundworms.

FLUKES.

These worms are usually flattened or leaf-life in appearance, though some flukes are rounded and conical. Their life history is interesting in that the larval stages develop in snails. When development in the snail is complete, the larvæ break out into the open and attach themselves to the grass, and so are swallowed by the sheep as it grazes.

THE LIVER FLUKE (*Fasciola hepatica*). (Plate 106.)

This species is found in the bile ducts of the liver. It is about 1 inch in length and tapers towards the posterior end. The body is usually pinkish and transparent and marked with dark lines and spots.

Plate 106.
LIVER FLUKE (natural size).

In areas where flukes are prevalent, they are responsible for a serious disease—fluke disease or liver rot. The species is practically unknown in sheep in Queensland, but is included here as it is sometimes seen in sheep in the Stanthorpe district and in the south-eastern part of the State and also in sheep brought in from the fluky areas of New South Wales. A fluky liver has a mottled appearance. The bile ducts are enlarged and stand out above the liver surface. On cutting into these numerous flukes will be seen.

THE CONICAL FLUKE (*Paramphistomum* spp.). (Plate 107.)

These flukes are stout conical-shaped pinkish worms found adhering to the walls of the paunch and honeycomb. They are particularly numerous in cattle in coastal and subcoastal areas and have occasionally been seen also in sheep.

The adult flukes in the paunch and honeycomb do not appear to be very harmful. The young flukes, however, live in the small intestine, and when sufficiently numerous can cause serious losses. So far conical fluke disease in sheep has been recorded only from South Africa and India, but as the adults are very common in Queensland the disease should be suspected in sheep in coastal and subcoastal areas when they show a persistent black, fœtid diarrhœa, rapid loss of condition, and bottle jaw. If the fluke is responsible, the small intestine for a short

distance from the fourth stomach will be very inflamed. On scraping the inflamed areas, large numbers of tiny stout flukes about $\frac{1}{25}$ of an inch will be found.

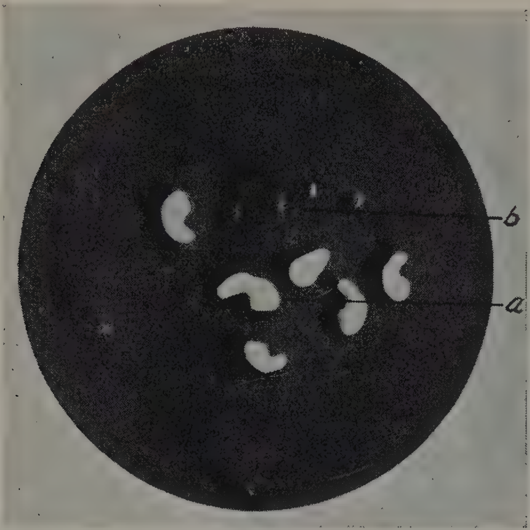


Plate 107.

CONICAL FLUKE.—(*a*) Adults as found in honeycomb and paunch; (*b*) young flukes as found in the small intestine (natural size).

TAPEWORMS.

These are elongate, flat, whitish worms which are found in the small intestine. At the anterior end of the tapeworm is a minute head, which is provided with suckers and sometimes also, though not in the case of the tapeworms infesting sheep, with hooks. The suckers and hooks enable the worm to attach itself to the wall of the intestine. Next to the head there is usually a very slender neck, which is followed by the body of the worm. This is composed of a number of short segments, which become progressively broader towards the posterior end. Some kinds of tapeworms are very minute in size, measuring only a fraction of an inch, whilst others may attain a length of 20 feet and more.

The life history of tapeworms is rather complicated. The segments at the posterior end of the worm contain large numbers of eggs. When the eggs are ripe, the segment drops off the body and passes out with the droppings. Further development of the eggs takes place only when they are eaten by a suitable intermediate host, such as an insect, a mite, or even a vertebrate, such as the sheep itself. Then when the insect, mite, &c., containing a larval tapeworm is eaten by the animal which passed the segments, the larva settles down in the small intestine and grows to maturity.

LARVAL TAPEWORMS.

The sheep acts an an intermediate host for a number of different tapeworms which in the adult stage occur in the intestine of the dog. Three of these are found in sheep in Queensland—namely, water ball or *Cysticercus tenuicollis,* sheep measles or *Cysticercus ovis* and hydatids or *Echinococcus granulosus.*

In each case the sheep becomes infested when it swallows eggs from segments passed by the dog. The adult worms grow in the intestine of the dog when it consumes these organs of the sheep containing the larval tapeworms.

Plate 108.
WATER BALL (natural size).

WATER BALL (*Cysticercus tenuicollis*). (Plate 108.)

This larval tapeworm is very common in sheep throughout the State. It has the appearance of a ball of fluid, within which is an opaque white centre, which is the future tapeworm head. The cyst, as a rule, hangs suspended into the abdominal cavity, though it may at times also be seen in the liver. The adult worm in the dog is known as *Tænia hydatigena.*

Water ball is of little importance in so far as the health of the sheep is concerned. The frequency with which it is seen, however, indicates a very common practice among sheep farmers of feeding raw offal to dogs, a practice which is also responsible for the spread of hydatids, a very serious disease of man.

SHEEP MEASLES (*Cysticercus ovis*).

These tapeworm larvæ appear as small cysts, $\frac{1}{3}$ of an inch in diameter, in the heart and muscles of the body. Should the larva die it becomes calcified. The adult tapeworm in the dog is called *Tænia ovis.*

Infestation does not appear to be harmful to the sheep unless it is very heavy. Infested portions of the body, however, are condemned as unfit for human consumption. Thus, this parasite can be responsible for serious economic loss.

The control measures for sheep measles are the same as those recommended for hydatids.

HYDATIDS.

This name is applied to the larval stage of a tiny tapeworm, which in the adult stage infests the dog. The larval stage is found in the sheep, pig, cow, man, and certain other animals. In the lower animals hydatids are of little consequence, but give rise to a serious and sometimes fatal disease in man.

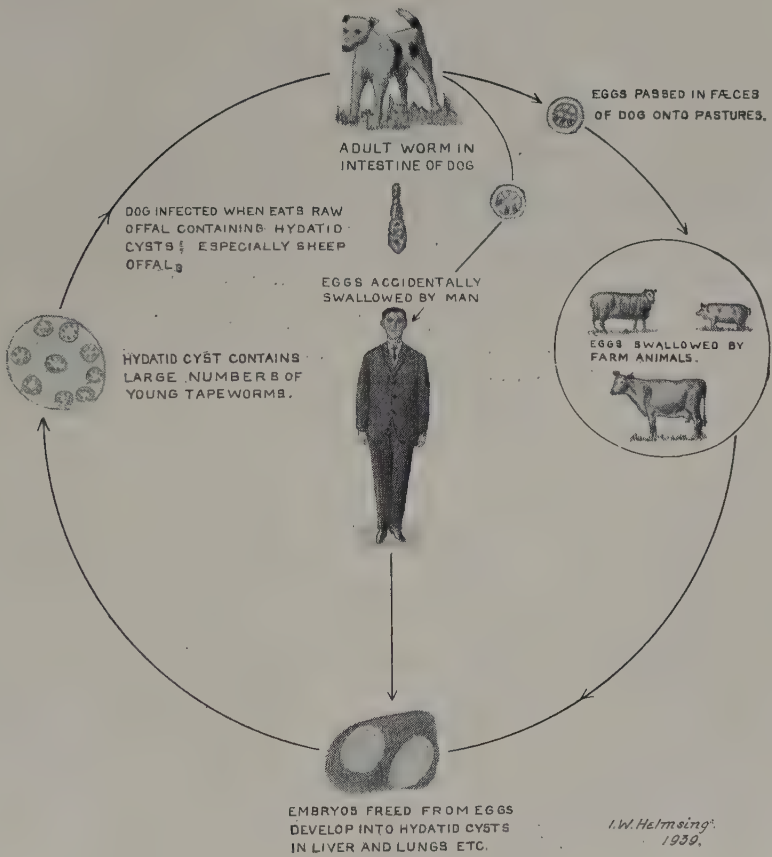


Plate 109.

How Man Becomes Infested with Hydatids.

1. Feeding raw offal, especially of sheep, to dogs.
2. Failure to treat dogs regularly for tapeworms.
3. Careless handling of dogs.

The hydatid cysts occur most commonly in the liver and lungs. They consist of bladders of fluid, which may grow as large as a child's

head. Sometimes a number of cysts may be seen in the liver and lungs, extending throughout a large portion of these organs. If a cyst is punctured, it will yield a fluid containing large numbers of tiny white specks, which are the future tapeworm heads. Such a cyst if fed to a dog will produce some thousands of adult worms. Some cysts, however, are sterile, and in these no white specks can be seen.

Man becomes infested with hydatids by accidentally swallowing eggs passed by the dog. The dog becomes infested with adult worms only when it eats raw offal containing hydatids. (Plate 109.) Australia and other sheep-raising countries, such as New Zealand, show a comparatively high rate of hydatid disease in man, because the sheep is the most favourable animal for the development of the larvæ or cysts.

CONTROL OF HYDATIDS.

Control of hydatid disease in man, as indicated above, is concerned with the dog, which harbours the adult tapeworm, and with the sheep, cow, and pig, &c., which are infested with the cysts, particularly the sheep. The first step, therefore, in the control of this disease is to prevent dogs from eating raw offal. The sheep farmer is the worst offender in this respect, for there are very few stations where it is not customary to feed dogs on the raw liver, lungs, &c., of sheep killed for human consumption or other reasons. Offal can be made quite safe by throwing it into boiling water and boiling it for ten minutes.

The second step is the regular treatment of dogs for tapeworms at about intervals of two months. Arecoline hydrobromide is the best drug to use. It may be administered in tablet form or else the tablets may be dissolved in water ($\frac{1}{2}$-grain tablet to 1 oz. of water). The doses are as follows:—

Small dogs	$\frac{1}{8}$ grain to $\frac{1}{4}$ grain.
Medium dogs	$\frac{1}{4}$ grain to $\frac{1}{2}$ grain.
Large dogs	$\frac{1}{2}$ grain to 1 grain.

Small puppies and toy dogs should be given only $\frac{1}{16}$ grain, a small kelpie $\frac{1}{2}$ grain, a large kelpie 1 grain, and so on.

The stomach should be empty when treatment is given. The animals should be tied up for about an hour or two after treatment. All fæces voided should be collected and burnt, as it will contain large numbers of eggs.

The third step in the control of hydatid disease is careful handling of dogs, especially by children.

ADULT TAPEWORMS.

Three species of adult tapeworms are found in the small intestine of the sheep. The most common species is known as *Moniezia expansa*. (Plate 110). They are all rather long creamy-white worms measuring, when fully grown, up to 18 feet in length and up to half an inch in breadth. Although tapeworms occur in sheep in practically every district in Queensland, they are most prevalent in the higher rainfall areas such as the Darling Downs and Central West.

Life History.

The eggs of the tapeworms as they lie in the pastures are eaten by certain species of mites which are present in the grass. After some time in the body of the mite, the larva which hatches from the egg reaches a stage when, if swallowed by a sheep, it would grow into an adult worm. The sheep normally becomes infested when it swallows mites containing these larvæ as it grazes.

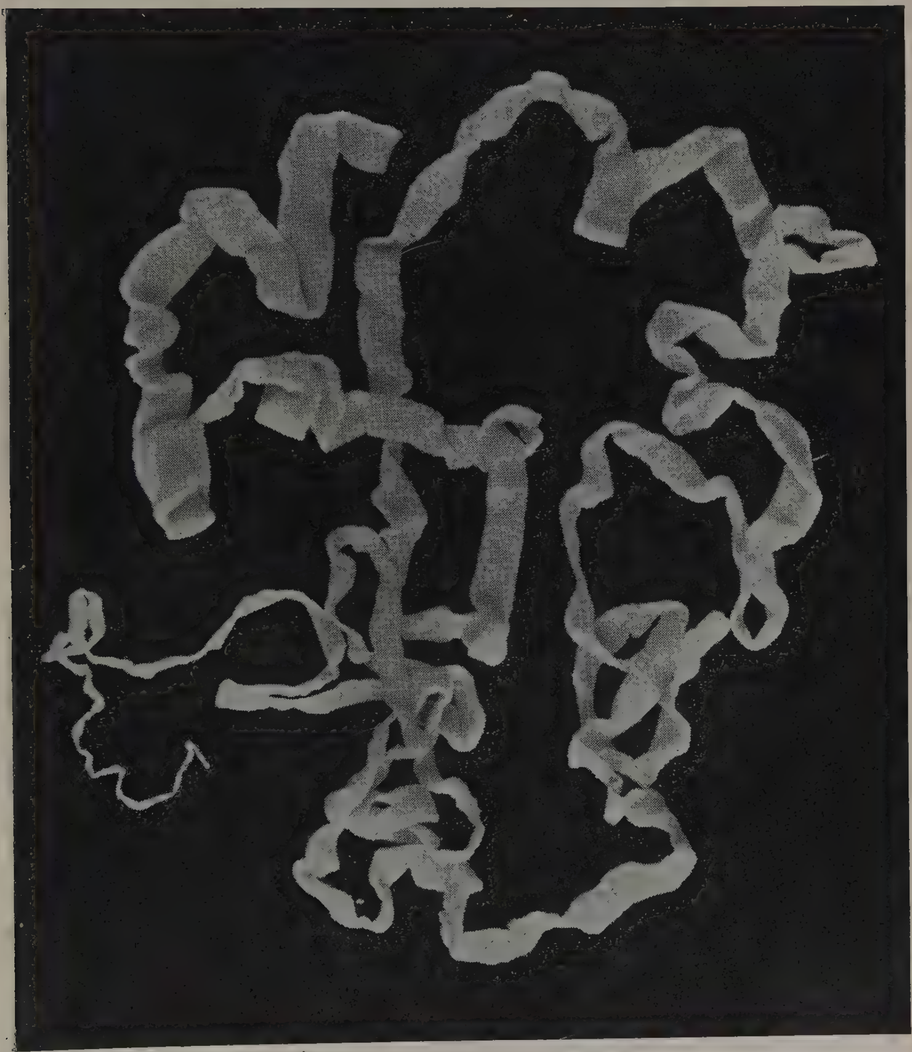


Plate 110.
TAPEWORM (natural size).

The mites are very common in pastures, particularly in damp areas. They are most active in the early morning and during dull, cloudy weather, and it is probably during these periods that the sheep usually becomes infested.

Effect on the Sheep.

As a rule tapeworms are seen only in young animals. Very little is known of their capacity for causing ill-health. Their large size has led many sheep farmers to consider tapeworms harmful, but before holding them responsible for any symptoms of worm-infestation that may be present a careful search should be made for other kinds of worms, such as the large stomach worm, nodule worm, and hairworms. Tapeworms have frequently been blamed for ill-effects which are really caused by hairworms, which on account of their small size can easily be overlooked.

Heavy infestations of tapeworms, however, may be serious in very young lambs, giving them an unthrifty, stunted, pot-bellied appearance, sometimes accompanied by diarrhœa.

Treatment and Control.

Suspected tapeworm infestation may be confirmed or otherwise by examining the droppings. The yellowish white segments are readily seen if tapeworms are present.

The worms may be removed by the bluestone and nicotine sulphate drench recommended for stomach worm (see p. 269).

Infestation of lambs may be prevented to a large extent by avoiding low-lying damp pastures.

ROUNDWORMS.

These are elongate, cylindrical worms, which taper towards the head and tail. They vary tremendously in size and include some very minute forms. The largest species found in the sheep, for example, measures about 3 inches in length, and the smallest only about $\frac{1}{25}$ of an inch. There are usually male and female worms, the males being the smaller.

The sheep becomes infested when it swallows larval worms as it grazes or drinks. These larvæ hatch from eggs laid by female worms in the sheep and passed out in the droppings. They undergo some growth and development in the droppings and eventually reach the infective stage, when they are each enclosed in a sheath which protects them from unfavourable influences such as dryness. Only these infective larvæ can give rise to adult worms in the sheep. They are capable of swimming up the grass blades when these are wet with dew or rain, and are thus swallowed by sheep when grazing.

No less than twenty-five different species of roundworms have been found in sheep in Queensland. Only the more important of these will be mentioned here.

THE LARGE STOMACH WORM OR BARBER'S POLE WORM

(*Hæmonchus contortus*). (Plate 111.)

This worm occurs in the fourth stomach, where it may be seen swimming around in the liquid contents or adhering to the stomach wall. The female worm measures about $1\frac{1}{4}$ inches in length and is red and white spirally striped. Hence the name barber's pole worm. The male worm is smaller and uniformly pinkish in colour.

Life History.

The eggs laid by the female worms pass out in the droppings and under suitable conditions of temperature and moisture hatch to give

rise to tiny larvæ. These continue to develop, and under summer conditions become infective in four to five days when they crawl up the grass blades to await grazing sheep. When the temperatures are low development is retarded and may cease altogether.

Plate 111.

Large Stomach Worm or Barber's Pole Worm (natural size).

The infective larvæ when swallowed by the sheep make their way to the fourth stomach. Here they settle down and grow to maturity in about three weeks.

Effect on the Sheep.

The large stomach worm is the most prevalent and most serious parasite of sheep in this State. It is a blood-sucker, and the effects of an infestation are primarily those associated with a loss of blood. One of the first symptoms is to be seen by examining the skin and the tissues in the mouth and under the eyelids. These, instead of being a nice healthy pink colour, are pale and even white. Sometimes, when sheep swallow massive numbers of larvæ, they may die in prime condition, and the only symptom seen is this paleness of the skin, &c. Usually, however, sheep swallow only comparatively small numbers of larvæ each day, and stomach-worm disease then becomes more of a chronic type. Infested animals hang around camps and water troughs and are disinclined to move about. The anæmia, which is denoted by the whiteness of the skin, &c., gradually becomes more pronounced and eventually a swelling appears under the jaw—"bottle jaw." When driven, the animals lag behind and fall over and finally become too weak to stand, and die. Scouring is not usually seen, but sometimes young sheep which are also infested with hairworms may suffer from this complaint.

When a heavily-infested sheep is examined the carcase will be found to be very emaciated and the blood thin and pale. On opening up the abdomen, fluid may be present in the abdominal cavity, and the fat will have been replaced by a jelly-like material. If the fourth stomach is slit open carefully some hundreds of worms will be seen, usually so numerous as to appear entangled with one another.

Treatment and Control.

While highly effective drenches are available for the treatment of stomach-worm disease, the preventive measures discussed on p. 257 should also be employed as far as practicable.

The following drenches are used in Queensland—

1. **Arsenic and Epsom Salts*.—This is probably the first drench to be ever employed in Australia against the stomach worm. It is a rather cumbersome drench to prepare and must be used very carefully. It is considered to be the least efficient of the drenches mentioned here.

2. **Arsenic and Bluestone*.—Also a cumbersome drench to prepare and considered to be too severe for continuous use.

3. *Bluestone*.—This is a reasonably effective, very safe, and very cheap drench. It is not, however, as satisfactory against the young worms in the stomach as bluestone and nicotine sulphate.

Recent work has shown that results from drenching with bluestone or bluestone and nicotine sulphate are to some extent dependent upon the bulk of the dose. If we use, for example, a 5 per cent. solution of bluestone, the dose for an adult sheep is 20 cubic centimetres and for a young lamb only about 7 cubic centimetres. Such a small dose tends to become lost when the lamb swallows it. On the other hand, the bulk of the dose should not be too large. It takes some time to administer—say, a 2-oz. dose of a 2 per cent. solution to an adult sheep—and much of it may also be lost during the process. It is therefore recommended that the following formulæ be used:—

(*a*) *For Grown Sheep*—

Bluestone	1 lb.
Water	2½ gallons.

Dose—

Sheep over 18 months	1 fluid oz.
Sheep 12-18 months	¾ fluid oz.

(*b*) *For Young Sheep*—

Bluestone	1 lb.
Water	5 gallons.

Dose—

Sheep 12-18 months	1½ fluid oz.
Sheep 6-12 months	1 fluid oz.
Sheep under 6 months	½-¾ fluid oz.

When mixing bluestone drenches always use enamel or earthenware vessels, as bluestone corrodes unprotected metal surfaces. Similarly, nickel-plated or copper drenching syringes should be employed. Mix up the drench from fresh, blue, bluestone only, and discard any white powder.

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* NOTE.—For those who prefer either of these arsenical drenches details of the formulæ, &c., will be supplied on request.

4. *Bluestone and Nicotine Sulphate.*—This is probably the most effective drench available. It was brought out primarily for hairworms, but is also very successful against the large stomach worm and tapeworms. The formula is as follows:—

Bluestone	1 lb.
Nicotine sulphate	12 fluid oz.
Water	$2\frac{1}{2}$ or 5 gallons.

The doses would be the same as advised for the bluestone drench.

5. *Carbontetrachloride.*—This is a very effective drug for the large stomach worm, and the small dose required makes it very easy to administer. Lambs are given 1 cubic centimetre of carbontetrachloride in 4 cubic centimetres of liquid paraffin, whilst adult sheep are given 2 cubic centimetres of carbontetrachloride in 3 cubic centimetres of liquid paraffin. It is a risky drench to use, as it may, at times, cause serious losses The reasons for these losses are not understood.

Drenches Recommended.

The following drenches are advised, and in their recommendation both their efficiency and their safety have been considered.

1. *Bluestone.*—This should be used primarily for ewes well advanced in pregnancy.

2. *Bluestone and Nicotine Sulphate.*—This should be employed for the regular routine drenchings as advised below.

This drench should be also used when drenching for outbreaks of stomach worm. For precautions in using this drench, see p. 273.

Carbontetrachloride is not given any recommendation whatsoever, as fatalities following its use in Queensland have been much too frequent.

Systematic Treatment.

Most sheep farmers treat their flocks only when the animals are so heavily infested as to be noticeably ill. This is a bad practice, for by judicious drenching he can keep the infestations so low that outbreaks do not occur.

Outbreaks may commence shortly after the spring rains, and continue through the summer and autumn. They are most prevalent during the continuous dull, showery weather of summer and early autumn, and are not seen to any extent during the winter.

Sheep of all ages may be affected, but young sheep, pregnant ewes, and ewes with lambs are most susceptible.

With these points in mind, the following recommendations may be made as being of practical value in preventing the worms from becoming sufficiently numerous to affect the health of the flock:—

1. Drenching should commence following the first spring storms, and should be continued throughout the summer and autumn at regular three to four weekly intervals.

All classes of sheep should be drenched. Lambs usually, however, do not require drenching until just before weaning. Special attention should be given to ewes which are to lamb in the winter. In the case of wethers, which are not as susceptible to infestation as ewes and lambs, the interval between drenchings may be extended to five to six weeks.

2. Ewes should lamb in a pasture which has been spelled for at least three months, or has been recently burnt. They should be drenched twice at an interval of ten to fourteen days before removal.

3. Lambs should be drenched twice at an interval of ten to fourteen days before weaning. After weaning they should be placed in a pasture that has been spelled for at least three months, or has been recently burnt.

4. All sheep should be drenched once in June, again in July, and again in August. Very little infestation takes place during the winter, and those drenchings clean out any worms left in the sheep.

5. All sheep introduced, especially from known "wormy" districts, should be drenched twice at an interval of ten to fourteen days, as soon as possible after they have been placed on the pastures.

The intervals between treatments are, of course, dependent upon the weather. If the season is dry, there is no need for such frequent drenching, but it is important that sheep in a dry spell should carry as few worms as possible.

In the event of an outbreak, drenchings should be continued with an interval of about ten to fourteen days between them, until the advent of dry, sunny weather.

Sheep to be removed to cultivated or improved pastures should be drenched before removal, and again ten to fourteen days later.

Sheep which have become very heavily infested may take some time to recover, despite the removal of most of the worms. This point is not always appreciated, and there is a tendency to hold the drench responsible as not being effective. Supplementary feeding by using improved pastures or by hand feeding is of great value in assisting a flock to recover from the effects of a heavy infestation.

THE LESSER STOMACH WORM (*Ostertagia* spp.). (Plate 112.)

This is a very slender brownish worm, about half an inch in length, which may be seen lying along the wall of the fourth stomach. It is most numerous in that portion of the stomach which leads into the small intestine. It is best detected by scraping the stomach wall and examining the scrapings in a glass dish held over a dark surface.

The lesser stomach worm is common in sheep on the Darling Downs, but is of little consequence as it is present only in very small numbers.

Its life history is very similar to that of the large stomach worm.

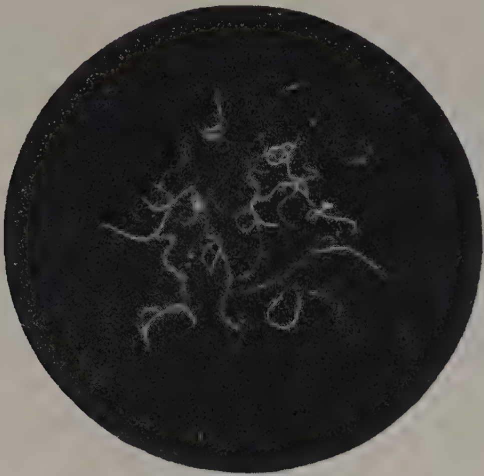

Plate 112.
Lesser Stomach Worm (natural size).

HAIRWORMS (*Trichostrongylus* spp.). (Plate 113.)

These are very tiny, hair-like, reddish worms, which are to be found in the wall of the fourth stomach, and of the first 20 feet or so of the small intestine. Their small size makes them easily overlooked, but they may be detected by examining scrapings in a glass dish held over a dark surface.

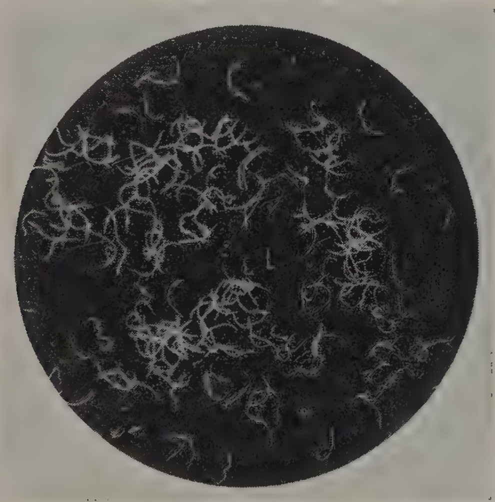

Plate 113.
Hairworms (natural size).

The life history of the hairworm differs only in detail from that of the large stomach worm. The sheep is infested when it swallows the infective larvae whilst grazing.

Effect on the Sheep.

In Australia, only the species inhabiting the small intestine are important. In Southern Australia hairworm disease is very prevalent, but, although the worms are widely distributed throughout Queensland, they are known to be serious only on the Darling Downs, particularly in the Stanthorpe area.

Hairworms are most important among young sheep, up to eighteen months and two years of age. Weaners appear to be particularly susceptible. One of the prominent symptoms of infestation is a dark, fœtid diarrhœa, which gives the disease its popular name, "black scours." Other symptoms are loss of condition, weakness, and a paleness of the skin and tissues of the mouth and eyes. These never become the dead-white colour seen with stomach worm infestation, nor does "bottle jaw" develop. Infested animals may die, but should they recover they may remain stunted in growth.

On examination of a dead sheep, except for a wasted carcase, there are no very obvious signs of the infestation. The disease can be diagnosed only by finding large numbers of worms in the small intestine. The method recommended to find these is discussed on p. 256.

Treatment and Control.

Hairworm disease, or "black scours," usually occurs only when the pastures are poor, and for this reason is most common during the late autumn, winter, and early spring.

Bluestone and nicotine sulphate is the only drench of value against these parasites. For the same reasons given for using different strengths of bluestone, when drenching for the large stomach worm, the following formulæ and doses are recommended for bluestone and nicotine sulphate:—

1. *For Grown Sheep*—

Bluestone	1 lb.
Nicotine sulphate ..	16 fluid oz.
Water	2½ gallons.

Dose.—

Sheep over 18 months	1 fluid oz.
Sheep 12-18 months ..	¾ fluid oz.

or

Bluestone	1 lb.
Nicotine sulphate ..	16 fluid oz.
Water	2 gallons.

Dose.—

Sheep over 18 months	20 cubic centimetres.
Sheep 12-18 months ..	15 cubic centimetres.

2. *For Young Sheep*—

Bluestone	1 lb.
Nicotine sulphate ..	16 fluid oz.
Water	5 gallons.

Dose.—

Sheep 12–18 months..	1½ fluid oz.
Sheep 6–12 months..	1 fluid oz.
Sheep under 6 months	½–¾ fluid oz.

When using this drench, the following precautions should be observed:—

(1) Nicotine sulphate is highly poisonous; therefore, mix the drench with the greatest care. The sample of nicotine sulphate used should be of good quality, and should contain 40 per cent., or thereabouts, of nicotine.

(2) Give no more than the recommended dose. Any more may be followed by ill-effects.

(3) For weak sheep give only a three-quarter dose.

(4) Be careful when drenching not to bruise or cut the tissues of the mouth or throat. If this happens, the nicotine may be absorbed and become dangerous.

Nutrition is a very important factor in controlling outbreaks of hairworms. In areas where these parasites are troublesome attention should therefore be given to pasture improvement (see p. 258). When this is not possible, supplementary feeding should be employed during those periods of the year when the pastures are poor.

When outbreaks occur, the lambs should be drenched twice, with a ten to fourteen days' interval between drenchings, and either hand fed or removed to improved pastures. Outbreaks may be prevented by regular drenching at intervals of about a month throughout the autumn and winter.

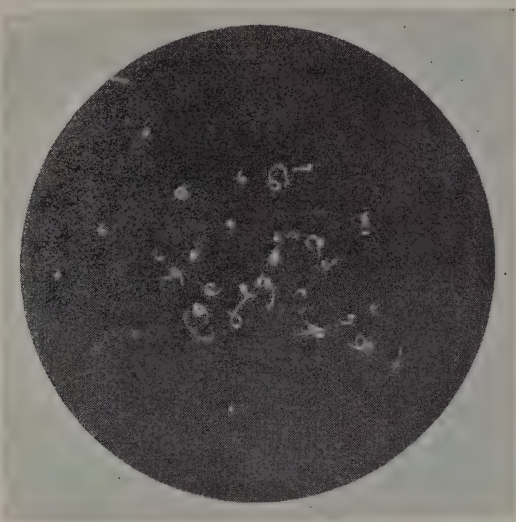

Plate 114.
Cooperia spp. (natural size).

COOPERIA spp. (Plate 114.)

These worms also occur is the small intestine. They are a little larger and somewhat stouter than hairworms. In scrapings made from the intestine wall and examined in a glass dish they may be distinguished from hairworms by their coiled appearance. They are of little importance in Queensland, as they occur in only very small numbers.

In countries where heavy infestations are seen they are considered to interfere with the normal growth of the sheep.

The life history of *Cooperia* spp. is very similar to that of the large stomach worm.

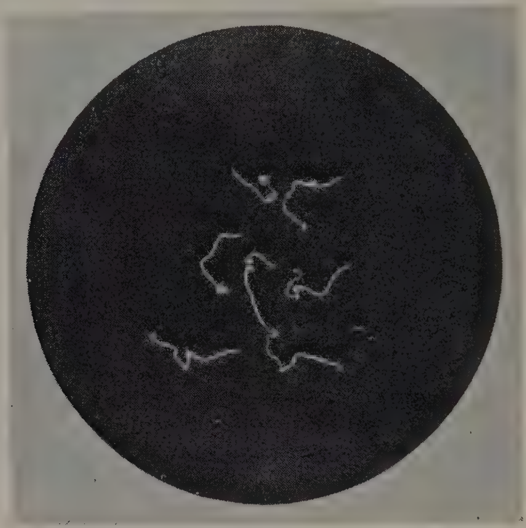

Plate 115.
THREAD-NECKED INTESTINAL WORMS (natural size).

THREAD-NECKED INTESTINAL WORMS (*Nematodirus* spp.).

These species may measure up to three-fifths of an inch in length, and are creamy to pink in colour. The anterior portion of the female is very slender and much coiled. They are found in the small intestine.

The thread-necked intestinal worm is of little importance in Queensland. It is found only in southern parts of the State, and occurs only in very small numbers.

THE HOOKWORM (*Bunostomum trigonocephalum*). (Plate 116.)

The hookworm is a stout species up to an inch in length and white to pink in colour. It is found in the small intestine, and may be distinguished from the other worms occurring there by its large size, and also by the way in which it is firmly attached to the intestine wall by its mouth.

Life Cycle.

The preliminary stages in the life cycle of the hookworm are similar to those of the large stomach worm. The infective larvæ, however, gain access to the sheep chiefly by penetrating the skin, though they may also be swallowed.

Effect on the Sheep.

This is a serious parasite, as it is a blood-sucker. It affects sheep in much the same way as the large stomach worm, but appears to be

more severe. At present the hookworm is rare in Queensland. It is mentioned here so that the sheep farmer can be on the watch for it, as in countries where it is prevalent it causes serious losses.

Plate 116.
HOOKWORMS (natural size).

THE NODULE WORM (*Oesophagostumum columbianum*). (Plate 117.)

The nodule worm is found in the large intestine, being most common from 1 to about 3 to 4 feet down from the junction of the small intestine. It is a whitish worm about five-eighths of an inch in length with the head end bent somewhat like a hook.

Plate 117.
NODULE WORMS (natural size).

Life History.

The eggs as usual pass out in the droppings and develop into infective larvæ. These ascend the grass blades on dewy mornings, or on dull showery days, and are swallowed by the sheep. When they reach the intestine they burrow into the intestine wall, where they remain for from several days to three to five months, depending largely on the age of the sheep. This invasion of the intestine wall involves chiefly the large intestine and causes nodule formation or "pimply gut." Nodule formation is much less conspicuous in young sheep than in old sheep. After leaving the nodule the young worm comes back into the intestine, where it settles down and grows to maturity.

Effect on the Sheep.

Nodule-worm disease can be very serious, and constitutes one of the principal reasons for the suspension of breeding in certain parts of the State. In cases where a massive infestation occurs, this may be rapidly fatal. The chronic type of nodule-worm disease is much more common, and the infested animals lose condition, show progressive weakness, and may be afflicted with a diarrhœa containing much mucus. If such sheep are driven they run with a stiff, awkward gait, and have a peculiar tucked-up appearance. The skin and mucous membranes of the eyes and mouth become pale, and there may follow a marked break in the wool. Death is not uncommon. Young sheep that survive remain stunted and unthrifty. The nodules in the intestine wall may interfere in the movements of the intestine and are probably responsible for the difficulty in fattening old infested sheep. The presence of nodules also renders the intestine useless for casings.

When a sheep suffering from nodule-worm disease is examined, numerous nodules will be seen along the length of the large and small intestine. If the large intestine is slit open and carefully examined numerous worms may be seen. In such cases the lining of the intestine in the locality inhabited by the worms will be inflamed, thickened, and thrown into folds and covered with a thick, pussy, blood-streaked secretion, in which the worms lie.

Treatment and Control.

The only effective treatment available for nodule worm at the present time is an enema of sodium arsenite and water. A bulk solution may be made by dissolving 4 oz. of sodium arsenite in three gallons of water. When treating sheep, 6 oz. of this solution are then taken and added to three gallons of water.

The quantities of this solution used for sheep of different ages are as follows:—

Aged sheep	1½ to 2 quarts.
6-month to 2-tooth ..	1 quart.
4-month to 6-month ..	1½ pints.
Up to 4-month	1 pint.

The enema may be delivered in two ways:—

(*a*) *By gravitation*—The sheep is held up by its hind legs, and a 3-foot length of pressure tubing is inserted through the anus as far as it will go. A funnel is attached to the free end of the tubing and elevated so that when the fluid is poured slowly into it, it will pass into the bowel.

(b) *By means of a large syringe.*

When delivering an enema, the following points should be borne in mind:—

(1) Starve for twenty-four hours, and, if possible, place the animals on green feed for a few days before treatment. This softens the contents of the bowel and reduces the quantity present.

(2) When computing the dose, the size of the sheep should be taken into consideration as well as its age.

(3) Deliver the fluid slowly and carefully, taking at least one minute to deliver a quart. Don't squirt it in violently.

(4) If the sheep struggles or strains suspend administration till the animal becomes quiet. If the fluid is run in while the animal struggles or strains fatal results may follow.

(5) Warm the fluid to blood heat if the weather is cold.

(6) Try the treatment on a few sheep for experience before using it on the flock.

This treatment, whilst admittedly a bit cumbersome and not without risk, is highly effective, and will remove practically every nodule worm.

Nodule-worm disease is acquired during the summer and autumn months, but does not usually become prominent till the late summer, autumn, and winter.

All sheep should therefore be treated during the autumn or earlier, if they are showing signs of infestation. This will send them into the winter free from worms. A further treatment should be given in July, for at this time the infestation from the pastures is at a minimum, and it presents an opportunity to remove any remaining worms.

Ewes in lamb should not be treated later than the second month of pregnancy.

The preventive measures discussed on p. 257 should be given every consideration.

THE WHIP WORM (*Trichuris* spp.). (Plate 118.)

This is a not uncommon species infesting the cæcum or blind gut, and adjoining parts of the large bowel. It receives its common name from its resemblance to a whip. It is white in colour, and when stretched out measures up to 2 to 3 inches in length.

Life History.

The life history of the whip worm is different to that of the other worms infesting sheep, for the whip worm egg does not hatch in the open. A tiny larva develops inside the egg which hatches only after it is swallowed. The young worm then makes its way to the cæcum where it settles down and grows to maturity.

Effect on the Sheep.

Little is known of the damage caused by whip worms. The worm buries its anterior end in the bowel wall, so heavy infestations may be injurious.

Plate 118.
WHIP WORMS (natural size).

Treatment and Control.

The enema treatment used against nodule worm is also effective against whip worms. It is, however, not advisable to use it for whip worms alone.

LUNG WORMS (*Dictyocaulus filaria*). (Plate 119.)

These are long, slender worms up to 4 inches in length found in the air tubes of the lungs. They are most prevalent in areas with a good winter rainfall, and for this reason outbreaks in Queensland are most frequent in the Stanthorpe-Warwick district.

Life History.

The eggs when laid by the female worms in the lungs contain small active larvæ. These are coughed up into the mouth and swallowed. As they pass along the intestine they hatch and the larva that is liberated eventually reaches the exterior in the droppings. Here, if conditions are suitable, the larva gradually grows to the infective stage. When these infective larvæ are swallowed by the sheep whilst grazing or drinking they burrow into the intestine wall and reach the lymph vessels, which carry them to the lungs where they mature.

Effects on the Sheep.

The first signs of lung-worm disease are frequent coughing and indications that the animal is finding it difficult to breathe. The animal becomes weak, listless, and loses condition. Sometimes a diarrhœa is present. Finally the breathing rate becomes very rapid, and the animal may die.

These symptoms are due to the tangled masses of worms in the air tubes, which so irritate the lung tissues as to cause pneumonia.

Treatment and Control.

Lung-worm disease occurs most frequently in the winter and early spring and is associated, as a rule, with poor nutrition and heavy

infestations of other worms, particularly hair worms and stomach worm. It is seen chiefly in young sheep. It can be prevented to a large extent by supplying supplementary foods during this dry period and by controlling hair worms and stomach worms.

Should an outbreak occur, the animals should be drenched with bluestone and nicotine sulphate, bearing in mind the weak state of the animals. They should then be provided with supplementary foods by hand feeding or also by using cultivations or improved pastures. Sheep so treated will in most cases throw off the lung worms and recover. As most outbreaks occur in pastures of a low-lying, marshy type, containing shallow, stagnant pools of water, the sooner the animals are drenched and removed the quicker will they recover.

Plate 119.
Lung Worms (natural size).

The worms in the lungs may be removed by injecting certain drugs into the windpipe. This method, however, should not be used in preference to drenching and feeding. The following formula is recommended for such an injection:—

Oil of turpentine	2 parts.
Creosote	1 part.
Chloroform	1 part.
Olive oil	4 parts.

Dose.—

Lamb	4 cubic centimetres.
Older sheep	6-8 cubic centimetres.

The injection is made between the rings of the windpipe by means of a hypodermic syringe fitted with a short needle. The operation is not an easy one, and should be carried out only by a person with experience in its use.

Yellow Patch of Tobacco Seedlings.

L. F. MANDELSON, B.Sc. Agr., Research Officer and E. C. TOMMERUP, M.Sc., Soil Bacteriologist.

DURING the past four or five seasons in North Queensland a disease of tobacco seedlings, known locally as "yellow patch" or "yellowing," resulted in poor and uneven stands of plants in many seedbeds and caused increasing concern. In 1936 this trouble was fairly general in the Mareeba and Dimbulah districts and was considered to be of major importance. It not only necessitated additional expense in producing seedlings, but also delayed the setting out of the crop and so at times adversely affected both yield and quality, as a result of the crop missing a considerable proportion of the most favourable growing season.

When it was found that the usual control measures for damping off, a seedbed disease not unlike the one under discussion, were unavailing, a careful investigation of the trouble was initiated. As a result of this work it was demonstrated that yellow patch is a physiological disease, apparently not described previously, which may be avoided by a variation in seedbed fertilizer practice from that generally employed in North Queensland in the past. The disease is associated with the use of nitrogenous fertilizers containing dried blood, or other organic substances such as cotton seed meal and fresh goat dung. There is, however, no loss of plants when nitrate of soda is used as the source of nitrogen.

The object of this article is to describe this disease and to summarise the investigations into its nature and control, which have been in progress since 1935.

Symptoms of the Disease.

In seedbeds which eventually develop yellow patch, the germination of tobacco seed is impaired and a greatly reduced number of seedlings emerge. The young tobacco seedlings which do emerge may, or may not, grow normally. Some patches of seedlings have small seed leaves, or cotyledons, and when the true leaves develop in from ten to fourteen days after germination the seedlings are stunted in growth and are pale green or yellow in colour and usually die off. Meanwhile, neighbouring plants continue growing normally with large, healthy green true leaves. The patches of diseased seedlings vary in shape and size. Individual seedlings in such patches have normally green seed leaves or cotyledons, which are the first leaves to develop, but leaves formed subsequently are pale green or yellowish. The affected patches do not increase in size, but new patches may later develop in a bed. Diseased seedlings remain stunted and yellow, the roots fail to branch and may rot before the plants eventually die. Consequently, after a few weeks, affected seedbeds present a ragged appearance with patches of bare soil surrounded by apparently normal plants. (Plate 120.)

In seedbed experiments it was found that the disease was associated with applications of dried blood and that entire plots had unsatisfactory stands rather than patches of affected plants. It is considered that this was due to the very even distribution of fertilizer materials over the surface of the area treated. On the other hand, with commercial seedbeds, fertilizers are not usually applied so carefully and consequently some areas in a bed receive more fertilizer than the rest of the seedbed.

Furthermore, dried blood being lighter than the other constituents of a commercial fertilizer tends to separate into layers so that when a mixture is applied to a seedbed, there may be an uneven distribution of the dried blood contained in it. Those areas, in such commercial seedbeds, which receive abnormally heavy dressings of blood produce seedlings more affected with yellow patch than do the other areas, and so there results the irregularities in stand which have been discussed above.

The proportion of plants which are lost in this manner varies considerably. In many cases, affected beds may be uprooted and resown, but even then yellow patch may again develop. The severity of the disease, however, decreases with time and as the soil is moistened and worked. After two or three attempts to establish a seedbed a satisfactory stand of plants may be obtained after resowing, provided no additional fertilizer is applied.

Plate 120.

Tobacco Seedbeds Damaged by Yellow Patch Disease.—An even germination was originally obtained in these seedbeds, but plants in the areas showing bare patches become yellowish, ceased growing, and eventually died out. The white appearance of these patches is due to the use of a mulch of coarse sand which is generally employed in North Queensland to control the activities of seed harvesting ants.

Preliminary Investigations.

In 1935, numerous affected seedbeds were examined, and it was considered that the disease was unlike any other recognised tobacco disease. From these field observations it appeared unlikely that the condition was caused by a pathogenic organism since it was noted that affected patches did not spread, and that the disease did not increase in severity when affected seedbeds were resown. Furthermore, Cheshunt Mixture, which has been found effective for controlling damping off diseases, did not mitigate the trouble. Some growers associated the condition with the practice of partially sterilising seedbed soil by burning wood or the inner portions of termite nests over the seedbeds.

During the seedling growing season of 1936 a seed-bed experiment was established at Dimbulah to explore several possible causes of the trouble. This experiment consisted of six seedbeds. The soils of pairs of beds was partially sterilised by burning wood over the surface, or by soaking with a formalin solution or by a Cheshunt Mixture solution being

applied at weekly intervals, commencing one week prior to the beds being sown. These beds were each subdivided into eight plots, seven of which received various fertilizer treatments, the eighth being a control plot to which no fertilizer was applied. Since it was found that yellow patch developed in certain plots receiving the same fertilizer treatment, irrespective of the nature of the soil sterilisation employed, it appeared that burning over the soil had no effect in causing the disease. Furthermore, since the regular application of the fungicidal Cheshunt Mixture exerted no control, it seemed unlikely that a plant pathogen was responsible for the trouble.

The seven fertilizer treatments included in this experiment and replicated at random in six seedbeds contained various combinations of the following plant food materials:—(1) Phosphoric acid at the rate of 1·92 oz. or 2·56 oz. per square yard in the form of superphosphate; (2) potash at the rate of 0·32 oz. or 0·96 oz. per square yard as sulphate of potash; (3) nitrogen at the rate of 0·64 oz. or 1·6 oz. per square yard, and applied either half as nitrate of soda and half as dried blood, or in the case of one treatment four-fifths as cotton seed meal and the remainder as dried blood and nitrate of soda.

It was found that variations in the quantity of potash or phosphoric acid did not adversely affect the growth of the seedlings. Those plots receiving the higher rate of nitrogen, however, produced strikingly poor stands of seedlings. In addition, plots which received no fertilizer at all, and so possibly suffered from lack of nutrition, had inferior stands of weak seedlings. These results were consistently observed in the six replications of the fertilizer treatments. (Plate 121.)

From this preliminary work it appeared that yellow patch was a physiological trouble closely associated with the application of organic nitrogenous fertilizers and was not caused by soil sterilisation or by plant pathogens. This conclusion suggested a likely explanation for the occurrence and gradual increase in the severity of the disease in North Queensland. Some eight or nine years ago, when the tobacco industry was in its infancy in that area, the Department of Agriculture and Stock recommended light applications of seedbed fertilizers and stressed the use of nitrate of soda. After some experience of tobacco culture, growers realised the vital importance of an ample supply of healthy and vigorous seedlings. Consequently there developed a tendency during recent seasons to apply goat manure to the seedbeds and to use increasing quantities of mixed fertilizers, often exceeding a pound per square yard. Since these fertilizers invariably contained dried blood as one source of nitrogen it is obvious that increasing quantities of organic nitrogen were added in succeeding years, until, in due course, the amount incorporated in the soil was sufficient to produce that toxicity to tobacco seedlings, which manifested itself in the condition known as yellow patch disease.

Glasshouse Investigations.

In 1937, typical reddish tobacco soil from Dimbulah as well as a rich Brisbane garden loam were used in a glasshouse experiment in Brisbane to further investigate the disease. Some plots of these two soils were sterilised with formalin and others were not sterilised. Fertilizer treatments used for both soil types consisted of either a low nitrogen application of ½ lb. per square yard of 4-10-6 mixture to supply 0·32 oz. of nitrogen per square yard, or a high nitrogen application of

2 lb. per square yard of 5-8-3 mixture to supply 1·6 oz. of nitrogen per square yard. In each mixture half the nitrogen was in the form of dried blood and half as nitrate of soda. Immediately after the application of the fertilizers the plots were sown with tobacco seed.

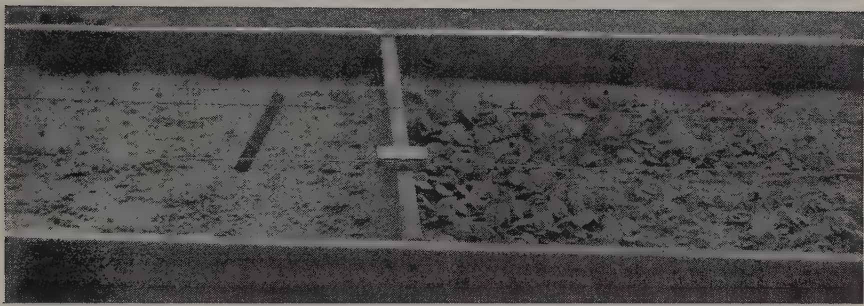

Plate 121.

Preliminary Seedbed Experiment.

Above.—

The first four beds on the left were in an experiment designed to explore the effect of various methods of soil sterilization, as well as fertilizer applications, on the incidence of yellow patch. Note the variations between the plots in each bed.

Below.—

Two plots in one of the beds illustrated above showing the effect of different rates of nitrogen, half of which was in the form of dried blood. Each plot received 2·56 oz. of phosphoric acid and 0·96 oz. of potash per square yard, but the one on the left received in addition 1·6 oz. of nitrogen and the one on the right 0·64 oz. of nitrogen. Note the differences in the stand and in the size of the plants.

Owing to poor germination, the results of this first sowing were not very satisfactory. Nevertheless seedling counts strongly suggested that the higher rate of nitrogen application was detrimental, irrespective of soil sterilisation, or the source of the soil used. There were 350 seedlings in the plots receiving the first treatment, compared with only 9 plants in the plots receiving the second treatment.

The soil of these plots was then allowed to dry out, and eight weeks after the commencement of the experiment they were resown without the

addition of fertilizers. Each plot, however, was subdivided, and half plots were treated with calcium sulphate with the object of possibly correcting any toxicity in the soil. In due course the results obtained indicated that the germination and growth of the seedlings were strikingly better where the low application of nitrogen had been used, the counts being 230 and 6 seedlings for the first and second treatments respectively, that the growth was slightly better where the soil had been sterilised, and that the addition of calcium sulphate did not have any beneficial effect.

Four months after the commencement of this experiment soil from each plot was transferred to small pots and sown with tobacco seed. The seed germinated normally and the stand of plants was fairly uniform in all the pots. It appeared, therefore, that by this time any factor detrimental to germination and growth had disappeared.

A more comprehensive pot experiment was also established later in the year to investigate the effect of various forms and combinations of forms of nitrogen on the incidence of yellow patch, as well as to ascertain the possible value of certain chemicals in mitigating toxicity in the soil. This experiment involved ten treatments in triplicate, and an unsterilised soil, conisting of a mixture of a sand and garden loam was used. Treatments comprised a 4-10-6 fertilizer mixture at the rate of ½ lb. per square yard and a 5-8-3 mixture at the rate of 2 lb. per square yard, as had been used in the previous glasshouse experiment. These applications supplied 0·32 oz. and 1·6 oz. of nitrogen per square yard respectively, half being in the form of dried blood and half in the form of nitrate of soda. In addition, the 5-8-3 formula was so compounded as to have its nitrogen component in the following forms:—Entirely as dried blood; or half as dried blood and half as sulphate of ammonia; or about four-fifths as dried blood and one-fifth as nitrate of potash, the latter also being used to supply the potash content of the fertilizer formula; or entirely as nitrate of soda.

Three additional treatments consisted of copper sulphate, manganese dioxide and potassium permanganate respectively being added to the 5-8-3 mixture, where the nitrogen was half in the form of dried blood and half as nitrate of soda. A control treatment was also included where no fertilizer was added to the soil.

Observations on seedling growth indicated, as in the previous experiments, that nitrogen in equal parts as dried blood and nitrate of soda, when applied at the rate of 1·6 oz. per square yard was more detrimental to germination and seedling growth than the same nitrogenous constituents applied at 0·32 oz. per square yard. (Plate 122.) When 1·6 oz. of nitrogen per square yard was supplied as dried blood alone, or as a mixture of dried blood and either sulphate of ammonia or nitrate of potash seedling growth was likewise weak. In contrast, however, a relatively good stand of healthy plants developed where this amount of nitrogen was applied entirely as nitrate of soda. The chemicals added to the 5-8-3 mixture were not effectual in reducing toxicity and stands were as poor with these treatments as where no such additions were made. The control plots also produced unthrifty stands of plants, possibly as a result of insufficient nutrition.

At various dates during the course of each of these glasshouse experiments, the soil was analysed for nitrate, ammonia, and organic nitrogen, as well as for soil reaction. It was noted with particular

interest that where nitrogen had been applied as dried blood and nitrate of soda, the ammonia nitrogen was practically the same at the commencement of the experiment, when either 0·32 oz. or 1·6 oz. nitrogen per square yard had been added, but it increased considerably in the case of the latter during the subsequent ten days. No significant differences were apparent from the other analytical data. It apears probable that the toxicity of the soil, as indicated by the unsatisfactory early development of the seedlings grown in it, may be correlated, with its abnormally high ammonia nitrogen content, caused by the biological decomposition of dried blood during this period. Analyses made at the time of the third sowing of the first glasshouse experiment indicated that the ammonia nitrogen content of the soil had then declined to normal levels, and this fact may be associated with the normal development of the seedlings at this stage.

Plate 122.

A Glasshouse Experiment to Investigate Fertilizer Treatment.

1. Treated with 4-10-6 mixture at ½ lb. per square yard to supply 0·32 oz. of nitrogen.

2. Treated with 5-8-3 mixture at 2 lb. per square yard to supply 1·6 oz. of nitrogen.

(Nitrogen half as dried blood and half as nitrate of soda in treatments 1 and 2.)

7, 8, and 9. Same treatment as 2 with the addition of potassium permanganate, managanese dioxide, and copper sulphate, respectively.

3. Same treatment as 2, except that all nitrogen supplied as blood.

4. Same treatment as 2, except that all nitrogen supplied as nitrate of soda.

5. Same treatment as 2, except that nitrogen supplied as blood and ammonium sulphate.

6. Same treatment as 2, except that nitrogen supplied as blood and potassium nitrate.

10. Control. No fertilizer applied.

Note relatively good growth with nitrate of soda treatment (4).

A somewhat similar type of injury has been observed in the United States of America.* In this case, serious root injury to cotton seedlings, growing on light sandy soil, occurred when heavy applications of cotton seed meal were made, and the injury was attributed to the formation of a toxic concentration of free ammonia from the decomposition of the cotton seed meal.

Field Experiments in 1938.

In the winter of 1938, in co-operation with field officers of the Agriculture Branch, an exploratory experiment was established at Dimbulah, to investigate the effect of dried blood, ammonium sulphate, and nitrate of soda when applied separately in three different quantities either at the time the tobacco seed was sown or earlier. Applications were made in such quantities as to supply 0·1 oz., 0·5 oz., or 1 oz. of nitrogen per square yard. In addition, 1 oz. of superphosphate to supply 0·2 oz. of phosphoric acid, and 0·25 oz. of sulphate of potash to supply 0·12 oz. of potash per square yard, were applied to all the plots in the experiment. These materials were added to the soil either twenty-one days, fourteen days, or seven days prior to sowing the tobacco seed, or else at the same time that the seed was sown.

Seedlings commenced to emerge through the soil ten days after the seed was sown, and seedling counts were made eleven and seventeen days subsequently. No significant differences were recorded between the various plot populations of plants. This lack of contrast may have been due possibly to the relatively low minimum temperatures recorded during the course of the experiment and to some unevenness in seed sowing, and in applying the sand mulch. However, symptoms of yellow patch were observed with certain fertilizer treatments and not with others. The yellowing appeared between the eleventh and seventeenth days after the emergence of the seedlings.

The total number of plants in the experiment showing yellow patch symptoms was 224. Of these, 216 occurred in plots where dried blood had been applied and only eight where ammonium sulphate was used as a source of nitrogen. No yellow patch at all was observed in plots receiving nitrate of soda. Hence of the fertilizer materials tested, dried blood was most consistently associated with the incidence of yellow patch. The distribution of diseased seedlings in plots where dried blood was applied is given in Table I.

TABLE I.

Fertilizer in Soil prior to Sowing Seed.	Number of Seedlings Affected with Yellow Patch.		
	0·1 oz. N.	0·5 oz. N.	1·0 oz. N.
0 days	..	..	9
7 days	1	48	134
14 days	..	1	16
21 days	1	..	6

* Willis, L. G., and Rankin, W. H. "Free-Ammonia Injury with Concentrated Fertilizers." Industrial and Engineering Chemistry 22: 1405. 1930.

From the table it will be noted that dried blood applied seven days prior to seed sowing, so as to supply 0·5 oz. of nitrogen or more per square yard of seedbed, was most conducive to the development of yellow patch under the conditions of this experiment.

An attempt was made at the termination of this experiment to investigate any residual effect of the fertilizers originally applied, by making a further application of dried blood to certain plots and resowing the beds. No positive information on residual effects, however, was obtained, although high applications of blood were associated with dwarfed seedlings and reduced counts, as in the previous experiment. During the course of these experiments, two series of applications of dilute solutions of zinc sulphate, copper sulphate, manganese chloride, iron sulphate, magnesium sulphate, borax, sodium nitrate, and free ammonia were made to the soil under both healthy and yellowed plants. In no case did yellowed plants make any recovery, while healthy plants were injured by the copper sulphate, magnesium sulphate, borax, and free ammonia. The symptoms following the application of free ammonia were similar to those of yellow patch disease; the free ammonia apparently only affected seedlings less than twenty-four days old, while eleven-day-old plants were not affected unless the concentration was greater than about twelve parts per million of soil.

In the spring of 1938 a further seedbed experiment was initiated at Dimbulah to ascertain the minimum quantity of dried blood which would cause the development of yellow patch. For comparison the effect of corresponding quantities of nitrogen in the form of nitrate of soda was also investigated. Sixteen levels or quantities of nitrogen were used, increasing from 0 by mounts of 0·1 oz. to a maximum application of 1·5 oz. of nitrogen per square yard. These sixteen levels were replicated three times, so that there were forty-eight plots receiving nitrogen in the form of dried blood, and the same number receiving nitrogen in the form of nitrate of soda. The plots receiving these treatments were randomised in the experiment. In addition to the nitrogenous fertilizers, all plots received applications of sulphate of potash and superphosphate at the rate of 0·25 oz. and 1 oz. per square yard respectively. Five days after the application of the fertilizers the plots were sown, and the seedlings commenced to emerge six days subsequently.

Careful observations were made eight days and seventeen days after emergence. From the outset it was obvious that even where 0·1 oz. per square yard of nitrogen, as dried blood, had been applied, the seedlings were relatively dwarfed. In contrast, all seedlings receiving corresponding quantities of nitrogen as nitrate of soda were of normal size. There were indications that causes, other than fertilizer treatments, were apparently responsible for variations in the relative plant populations of plots, both where nitrate of soda and dried blood had been applied. Nevertheless, it was noted that as the quantity of dried blood was increased above about 0·3 oz. of nitrogen per square yard, there was a definite tendency for the population of seedlings to decrease. Where the application exceeded 0·5 oz. of nitrogen per square yard, there was a striking and significant decrease in the number of seedlings which survived. It was obvious, therefore, that at this level of nitrogen dried blood was definitely detrimental to seedling stand under the environmental conditions of the experiment. On the other hand, nitrate of soda, on the whole, did not adversely affect either the growth of the plants or the number of the seedlings which emerged.

TABLE II.

COUNTS OF SEEDLINGS PER SQUARE FOOT OF SEEDBED IN 1938 YELLOW PATCH EXPERIMENT.

Level of Nitrogen.	Nitrate of Soda.			Dried Blood.		
	Mean Counts of Three Replicates.		General Mean.	Mean Counts of Three Replicates.		General Mean.
Ounce per Square Yard.	8 Days After Emergence.	17 Days After Emergence.		8 Days After Emergence.	17 Days After Emergence.	
0	72	61	67	75	73	74
0·1	51	47	49	50	82	71
0·2	68	92	80	51	61	56
0·3	73	66	69	47	40	44
0·4	52	51	52	36	41	39
0·5	101	88	94	36	47	42
0·6	95	80	87	6	10	8
0·7	64	73	68	11	9	10
0·8	51	54	52	6	11	9
0·9	84	80	82	2	4	3
1·0	101	65	83	4	3	4
1·1	54	53	54	3	3	3
1·2	40	49	45	4	5	5
1·3	57	61	59	0	1	1
1·4	69	68	69	2	2	2
1·5	66	77	72	0	0	0
Means.. ..	68·6	66·6	67·6	21·4	24·5	23·0

Seedling counts are summarised in Table II., which is based on the mean counts of three replicates of each treatment. The general means of plant populations for these observations are also presented graphically. (Plate 123.) It will be seen clearly from this graph that where nitrate of soda was applied, plant populations varied fairly regularly about the mean population for all nitrate of soda treatments, and hence these fluctuations apparently were not due to the quantity of nitrate of soda applied. On the other hand, where dried blood was applied, plant populations decreased fairly regularly with increasing applications, until no plants at all survived where the maximum application of 1·5 oz. of nitrogen per square yard in the form of blood was made.

Field Evidence on the Influence of Seedbed Fertilizers.

During the 1936-37 season some experiments were established at Dimbulah to investigate the control of insects and blue mould disease in seedbeds. The fertilizer mixture used for this work consisted of ½ oz. of nitrate of soda and 1 oz. of superphosphate per square yard. as recommended by Mr. N. A. R. Pollock in the departmental publication "Tobacco Growing in Queensland." These beds produced normally healthy plants, whereas most seedbeds in the district, where heavy applications of the 4-10-6 fertilizer mixture, frequently with the addition of goat manure, had been used, were more or less affected with yellow patch. During the same period the preliminary seedbed experiment to invesigate yellow patch indicated, as mentioned above, that the disease was closely associated with the use of organic nitrogen. It appeared therefore that these seedbeds escaped yellow patch because the fertilizer applied contained only nitrate of soda as a source of nitrogen without organic nitrogen such as dried blood, which was so general in the mixed fertilizers used on commercial seedbeds.

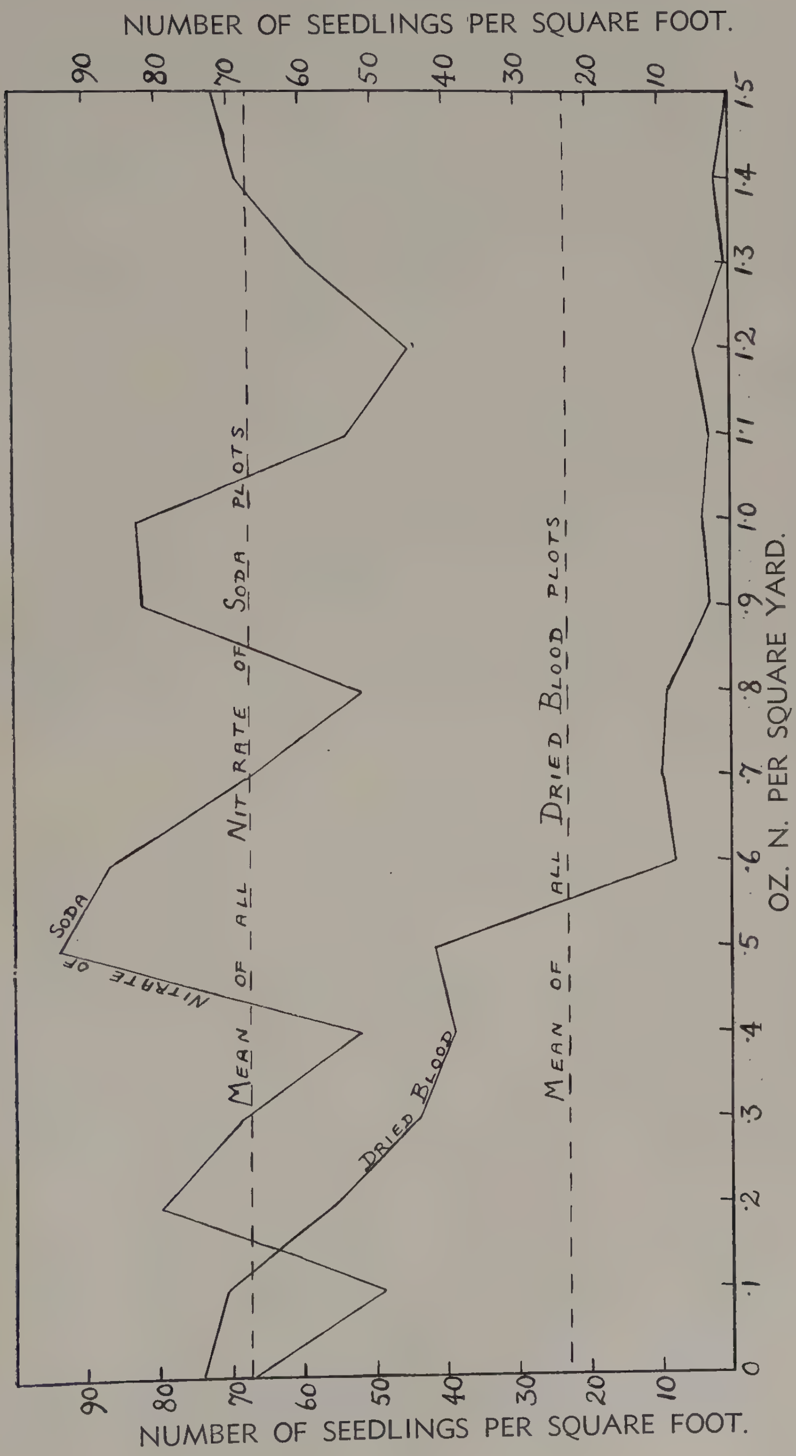

Plate 123.

Graph showing general means of seedling counts as given in Table II. Note how the plot populations decrease rapidly when dried blood, to supply nitrogen in excess of 0·5 oz. per square yard, is applied.

TABLE III.

SEEDLING POPULATIONS IN INDIVIDUAL PLOTS OF THE 1938 DEMONSTRATIONS FOR THE CONTROL OF YELLOW PATCH.

Treatments. High Level of Nitrogen. (N. = 1·28 oz. per square yard.)	1. N. as Nitrate of Soda.				2. N. as Nitrate of Soda. and Dried Blood.				3. N. as Dried Blood.			
Serial Numbers of Demonstrations	M.S.E. 2	M.S.E. 3	D.S.E. 7	D.S.E. 8	M.S.E. 2	M.S.E. 3	D.S.E. 7	D.S.E. 8	M.S.E. 2	M.S.E. 3	D.S.E. 7	D.S.E. 8
Counts of seedlings in five replicates of each treatment	396	2,304	1,312	1,070	40	0	708	233	176	0	152	32
	876	1,548	952	900	66	198	788	268	2	0	287	24
	2,212	1,863	1,028	1,220	2	180	1,268	53	28	108	594	90
	465	1,647	784	1,090	8	360	900	17	0	414	440	130
	1,896	2,016	1,152	1,090	78	432	599	183	10	342	257	3
Means	1,169	1,876	1,046	1,074	39	234	853	151	43	173	346	56

Treatments. Low Level of Nitrogen. (N. = 0·078 oz. per square yard.)	4. N. as Nitrate of Soda.				5. N. as Nitrate of Soda and Dried Blood.				6. N. as Dried Blood.			
Serial Numbers of Demonstrations	M.S.E. 2	M.S.E. 3	D.S.E. 7	D.S.E. 8	M.S.E. 2	M.S.E. 3	D.S.E. 7	D.S.F. 8	M.S.E. 2	M.S.E. 3	D.S.E. 7	D.S.E. 8
Counts of seedlings in five replicates of each treatment	448	1,728	1,288	875	130	576	808	1,015	1,648	1,377	800	790
	1,052	2,232	1,072	870	1,284	90.	1,044	980	712	1,413	840	1,090
	1,792	1,800	1,116	890	1,716	2,529	784	1,240	1,140	2,412	1,040	970
	844	1,971	1,208	1,280	1,076	1,863	936	1,030	1,316	1,152	1,052	1,470
	1,308	2,700	1,240	1,050	1,600	1,206	764	1,160	1,128	1,899	1,576	1,080
Means	1,089	2,086	1,185	993	1,161	1,253	867	1,085	1,189	1,651	1,062	1,080

TABLE IV.

AVERAGE NUMBER OF SEEDLINGS PER TREATMENT IN THE 1938 DEMONSTRATIONS FOR YELLOW PATCH CONTROL.

Demonstration Number.	Treatments.					
	High Nitrogen Level.			Low Nitrogen Level.		
	1. Nitrate of Soda.	2. Nitrate of Soda and Blood.	3. Blood.	4. Nitrate of Soda.	5. Nitrate of Soda and Blood.	6. Blood.
M.S.E. 2 (Mareeba)	1,169	39	43	1,089	1,161	1,189
M.S.E. 3 (Mareeba)	1,876	234	173	2,086	1,253	1,651
D.S.E. 7 (Dimbulah) ..	1,046	853	346	1,186	867	1,062
D.S.E. 8 (Dimbulah) ..	1,074	151	56	993	1,085	1,080
Means..	1,291	319	155	1,338	1,092	1,246

Consequently, the following season Mr. R. C. Cannon, Instructor in Agriculture, who was the field officer then stationed at Dimbulah, recommended nitrate of soda and superphosphate for seedbeds to a number of growers in that district. In all cases where this recommendation was carried out there was complete freedom from yellow patch, although the trouble was quite general throughout Dimbulah that season.

Demonstrations on the Control of Yellow Patch in 1938.

Before the commencement of the 1938-39 season, sufficient data had been collected from experiments and observations to indicate that yellow patch could be avoided by using only nitrate of soda as a source of nitrogen in seedbed fertilizers. An advisory note was consequently distributed to growers during August, 1938, describing the symptoms of the trouble and recommending the nitrate of soda and superphosphate mixture which had been so successfully used the previous season.

To give growers an opportunity to observe the effect of fertilizer treatment on the incidence of yellow patch prior to establishing their own seedbeds, a simple demonstration was designed and established both at Mareeba and Dimbulah in August, 1938. This work was repeated two months later at both centres so that, in all, the demonstration was replicated four times.

In this demonstration, all seedbeds received a general application of superphosphate and sulphate of potash at the rate of 1 oz. and $\frac{1}{4}$ oz. per square yard respectively. The nitrogenous portion of the fertilizer consisted of nitrate of soda alone, dried blood alone, or a mixture containing half the nitrogen as nitrate of soda and half as dried blood. These sources of nitrogen were applied so as to give either a very low application of 0·078 oz. or a high application of 1·28 oz. of nitrogen per square yard of seedbed. The lower application was the equivalent of $\frac{1}{2}$ oz. of nitrate of soda per square yard, which was the departmental recommendation for yellow patch control. These six

fertilizer treatments were replicated five times in each demonstration. A demonstration consisted of five seedbeds (Plate 124), each of which contained three plots receiving a heavy application of nitrogen and three plots receiving a low application of nitrogen.

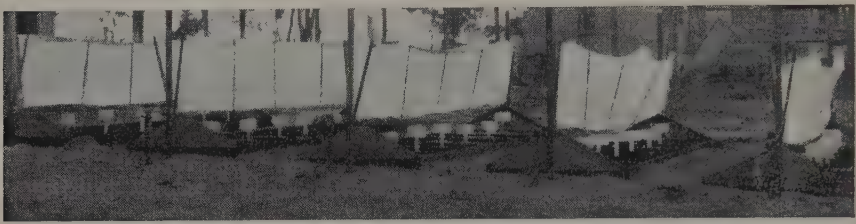

Plate 124.

YELLOW PATCH CONTROL DEMONSTRATION.

Above.—

General view of a demonstration at Mareeba showing five seedbeds, each of which contained the same six fertilizer treatments.

Below.—

One seedbed of the demonstration illustrating failure due to yellow patch in two plots where a high level of nitrogen was used either as dried blood or a mixture of dried blood and nitrate of soda.

Careful counts of seedlings were made during the progress of the demonstrations, and these are summarised in Tables III. and IV. The counts were made ten or eleven days, or in the case of one demonstration, D.S.E. 8, nineteen days after the seedlings emerged. Figures for demonstration D.S.E. 7 indicate that the plant populations for plots receiving the high level of dried blood and nitrate of soda mixture were not on the average less than where the mixture at the low level was applied. This was the position eleven days after the seedlings emerged and was possibly due to low temperatures occurring where the demonstration was situated and the consequent slow decomposition of the dried blood. At a later date, however, a relatively poor stand of plants survived where the higher rate of nitrogen was used. It will be noted that seedling counts for the other demonstrations definitely indicate that dried blood, either alone or in combination with nitrate of soda, when

used at the high rate of 1·28 oz. of total nitrogen per square yard, resulted in a very poor stand of plants. These treatments caused poor germination and induced yellow patch symptoms and the contrast with plots receiving other treatments was striking. (Plate 124.) Satisfactory stands of plants were obtained where the higher level nitrogen was used entirely in the form of nitrate of soda, or with the lower level of nitrogen, irrespective of the source.

The demonstrations suggested that it was dangerous to use dried blood at all, and particularly in relatively large quantities, either alone or in association with other sources of nitrogen in mixed fertilizers for tobacco seedbeds.

As soon as the first of these demonstrations was concluded at Mareeba and Dimbulah a second advisory note was issued to tobacco growers. In it the results obtained from this work were reported and growers were again warned that it was not safe to use dried blood in seedbed fertilizers. They were advised to use the fertilizer mixture, included in these demonstrations, where nitrate of soda at the rate of ½ oz. per square yard, or 0·078 oz. nitrogen, had been employed.

In the Dimbulah district most growers promptly followed this advice and succeeded in raising satisfactory plants free from yellow patch during the 1938-39 season. However, the disease made its appearance, as in the past where this advice was ignored and heavy dressings of fertilizers containing organic nitrogen were applied.

Recommendations for the Control of Yellow Patch.

As a result of the work reported in this paper the following fertilizer mixture for tobacco seedbeds is recommended:—Nitrate of soda, two parts by weight; superphosphate, four parts by weight; and sulphate of potash, one part by weight. This mixture should be applied at the rate of 1¾ oz. per square yard, which is the equivalent of 1¼ lb. for each 100 square feet or 12½ lb. for each 1,000 square feet of seedbed. Such a mixture may be obtained from fertilizer manufacturers, or may be prepared on the farm.

Since the quantities specified make a small bulk of material to apply, it is suggested that, in order to effect an even distribution of the fertilizer, it might be carefully diluted with ashes or with sand or soil, which has been sterilised with heat. Soil from the burnt-over surface of seedbeds might be conveniently used for the purpose. After the fertilizer has been scattered over the surface of the beds it should be lightly raked into the soil prior to sowing the tobacco seed.

Further light applications of nitrate of soda, dissolved in water, may be made from time to time, should it be considered necessary to stimulate seedling growth. After any such dressing it is most important that the nitrate of soda be thoroughly washed off the leaves to avoid burning of the foliage.

Summary.

During the past four or five years a disease of tobacco seedlings, known locally as yellow patch, or yellowing, has caused increasing concern in North Queensland. This condition has not previously been described. In affected seedbeds the germination of the seed is poor, patches or groups of plants are dwarfed and may turn pale green or yellow about ten days after emergence, before they eventually die, thereby causing a

poor and uneven stand of seedlings. Since 1935, this disease has been investigated in seedbed and glasshouse experiments, assisted by soil analyses. The work has indicated that yellow patch is a physiological disease associated with the use of excessive quantities of organic nitrogen in mixed fertilizers on seedbeds. It is probably caused by the accumulation of free ammonia in the soil, which is produced by the decomposition of organic matter, coming in contact with the roots of the seedlings. Even 0·1 oz. of nitrogen as dried blood per square yard retarded growth and where the quantity applied exceded $\frac{1}{2}$ oz. per square yard, practically all the seedlings failed to survive. The critical quantity conducive to yellow patch and the period which elapses prior to the observation of the disease symptoms are probably closely corelated with soil temperatures and microbial activity in the soil. Attempts to rectify the toxicity in the soil by the addition of certain chemicals were not successful, but it was observed that this toxicity was not permanent and disappeared in time.

Yellow patch did not develop where only nitrate of soda was used in various quantities as a source of nitrogen in seedbed experiments and demonstrations. Growers were accordingly advised to use a seedbed fertilizer mixture consisting of two parts of nitrate of soda, four parts of superphosphate, and one part of sulphate of potash by weight at the rate of $1\frac{3}{4}$ oz. per square yard of seedbed. Where this recommendation was followed during the 1938-39 seedbed season satisfactory seedlings were produced, which were free from yellow patch.

Acknowledgements.

The authors wish to acknowledge the helpful co-operation of Messrs. R. C. Cannon, H. McNee, and C. Whitehead of this department in the establishment of the seedbed experiments and demonstrations in the Mareeba and Dimbulah districts, and in the compilation of seedling counts and the careful observations made by them in connection with this work. Acknowledgment is also made to Miss Barbara Shield and to Messrs. W. J. Cartmill and F. Keogh, also of this department, for the statistical analyses of the experimental data, and for the chemical analyses of the soils respectively.

FOR MEASURING LAND.

Take three strips of wood and nail them together, as shown in the diagram. One strip projects at the top to form a handle, and the two uprights are each brought to a dull point at the bottom. A convenient distance between the points is 6 feet, but some

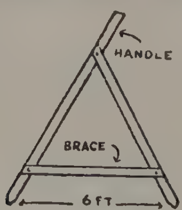

Plate 125.

might prefer them to be half a rod or 8 feet 3 inches. In using this measuring device the ends are swung around alternately. Be sure to travel in a straight line, and when measuring soft ground it is necessary to guard against slippage.

Ulcerative Spirochaetosis of Pigs.

J. A. RUDD, Veterinary Surgeon, Director Animal Health Station, Yeerongpilly.

SEVERAL cases of ulcerative spirochaetosis of pigs have been brought to the Animal Health Station. The condition has been definitely diagnosed in Queensland. The disease has been found in material forwarded from Boonah and also at Cairns. A short digest of all the available information concerning the disease is published in these notes. It is not yet possible to estimate the extent to which spirochaetosis is present in Queensland.

Plate 126.
A Typical Skin Lesion of Ulcerative Spirochaetosis.

Cause of Ulcerative Spirochaetosis.

As the name denotes, the disease is caused by a spirochaete or spiral-shaped organism.

Apparently they gain entrance to the body through wounds and scratches of the skin or deeper structures. It is not uncommon to find the sockets of the teeth affected when the milk teeth are being shed, and it is frequently seen causing large abscesses following defective sanitation after castration.

Other organisms may also be present, but are regarded as secondary invaders and not the primary cause, which is a spirochaete.

Plate 127.

ULCERATIVE SPIROCHAETOSIS OF CASTRATION WOUND.—Note the protruding mass of excessive granulating tissue.

Symptoms and Lesions.

When the spirochaete gains entrance to the tissues, it seems to remain more or less localised. A swelling which appears in the skin and underlying tissues gradually enlarges, finally bursts, and a dirty greyish pus is exuded. The ulcer so formed does not heal, but gradually extends and becomes covered with a dark granular scab, usually adhering firmly and having under it the pus already described. This lesion may be anything up to 6 to 9 inches in diameter. There is considerable

new tissue, fibrous tissue, and debris as a result of the chronic inflammation. The base of the ulcer is often fairly firm and adherent to the surrounding tissue, but almost invariably the pus extends and affects the deeper structures to a greater or lesser extent.

In the case of infection of the jaws during the shedding of teeth, the jawbone is infected, resulting in channels of pus, dead bone, and loosening of teeth. The tongue often becomes ulcerated and large pieces of it may slough off altogether.

In the case of young pigs the disease is often fatal, but the older ones usually recover.

Plate 128.
Sucker with Mouthparts Affected with Ulcerative Spirochaetosis.

Control.

(1) Isolate all pigs affected with the disease in clean styes with concrete floors which should slope towards a common drainage system and concrete catchment pit, which could be frequently disinfected and emptied.

(2) Clean and disinfect yards, troughs, &c.

(3) Feed only in concrete troughs, and do not allow wallows or muddy pools for pigs.

(4) Build fresh paddocks for pigs on uncontaminated ground, and do not use barbed-wire, as it may cause cuts and wounds and thus facilitate infection.

(5) Operation of castration should be done under strictly hygienic conditions, and the pigs placed in sties with concrete floors which are cleaned for the purpose.

(6) Operation of castration should be performed as follows:—Scrub around the site of operation with a nail brush saturated with 1-200 cylline. Proceed with the operation of castration as usual, and swab around the wound with 10 per cent. carbolised glycerine. Keep the pigs from food and water for twenty-four hours before operation.

(7) Sows and suckling litters should be kept particularly clean, as young pigs are infected in the mouth from the teats of their dams. Concrete floors are the only rational means of combating this trouble, and they should be kept scrupulously clean.

Treatment.

The pigs in Plates 126 and 127 were specially picked, as they were the worst cases among a large number. The pig in Plate 126 was kept on a clean concrete floor. The wound was painted with pure carbolic at intervals of once a week and also with liquor iodi fort. in between, and dusted with slaked lime daily. This pig continued to put on condition right throughout the period of treatment, and was sold to the bacon factory and paid for as first grade. The pig in Plate 127 could be placed in a separate category, as the wound was a castration infection and very deep-seated. Deep injections of a solution of one of the arseno mercurial preparations were given as several injections on the same site. The subject fattened rapidly, and was destroyed in order to ascertain the extent of the lesions, but there was no evidence of any noticeable damage to the underlying tissues except a very slight shrinkage of the right flank, which was hardly noticeable and was passed fit for human consumption. The little pig on Plate 128 was destroyed, being past treatment and was a good case of teat infection.

KEEPING PEACE IN THE PIG PEN.

It is common enough to have some scrapping among a pen of young pigs put together for the first time, and there are well-known precautions—such as smearing them with oil. Here is another tip from a farmer who had to spend a lot of time recently in refereeing a fierce fight in a pen of baconers. The fight started again as soon as his back was turned, and, as a result, one pig had to be destroyed and another was badly mauled. He tried giving extra feed, thinking that lack of protein was the cause of bad temper in the pen, but still the fight went on. Then someone suggested that the housing of the pigs was dark and uncomfortable. The farmer took the tip and made the pigs more comfortable in better surroundings. The baconers accepted the measures of appeasement, declared an armistice, and proceeded to put on the weight that hastened their end on the factory killing floor. Comfortable, well-lighted quarters for growing baconers are the points of the obvious moral.

The Determination of Milk Solids and its Application in the Dairy Industry.

L. A. BURGESS, A.A.C.I., Dairy Technologist.

AN accurate chemical analysis is the only infallible method of determining the exact composition of a sample of milk. This is laborious and unsuitable for routine work at milk depots, cheese factories, &c., where rapid methods are essential. Owing to the comparative constancy of the relative proportions of constituents other than milk-fat and the physical properties of milk-fat itself, rapid empirical methods have been evolved which are remarkably accurate for milks of normal character. All such methods lose their accuracy to a certain extent if the milk is abnormal, but in the majority of such cases the results are sufficiently unusual to indicate that an abnormal milk is being dealt with. Such empirical methods include the Babcock and Gerber tests for fat, the neutral formaldehyde method for casein, and the determination of solids by means of hydrometers. This article will deal with the determination of solids in milk and buttermilk by means of hydrometers and methods of applying the results at milk depots, cheese and butter factories.

The first essential is to accurately determine the percentage of fat in the product under examination. This is done by the Babcock method for milk and the normal butyl alcohol method for buttermilk. These methods have been given in detail in a previous article (1). The other equipment required is specified below.

(1) *Quevenne Lactometer* (see Plate 129).—This is really a very sensitive specific gravity hydrometer constructed specially for milk. Lactometers are graduated in "degrees" which represent the second and third decimal place of the specific gravity. For example, 32 deg. on lactometer represents a specific gravity of 1·032, 28 deg. represents 1·028, and so on.

Alternatively, a British standard density hydrometer for use in milk, such as is illustrated in Plate 130, may be used. The hydrometers are constructed in two ranges—(*a*) density of 1·025 to 1·035, for use in normal milks; (*b*) density of 1·015 to 1·025, for use in milks of low density and for buttermilks which usually contain a large proportion of added water. They are graduated to indicate density which is slightly different to the specific gravity on which the older Quevenne lactometer degrees are based. It is important that the operator should know which instrument is being used, as the formulæ used to calculate the total milk solids differ slightly for the two instruments.

(2) *Cylinder* of glass or metal with the top finished off square and without a spout. The diameter should be sufficiently large to enable the lactometer to float freely without touching the sides, and the depth should be approximately that of the total length of the lactometer. The cylinder should stand firmly without rocking in a true vertical position. A glass cylinder is shown in Plate 129, and the constructional details of a metal cylinder are shown in Plate 131. The dimensions given are for a British standard density hydrometer, size No. 1, and would require modification for other instruments.

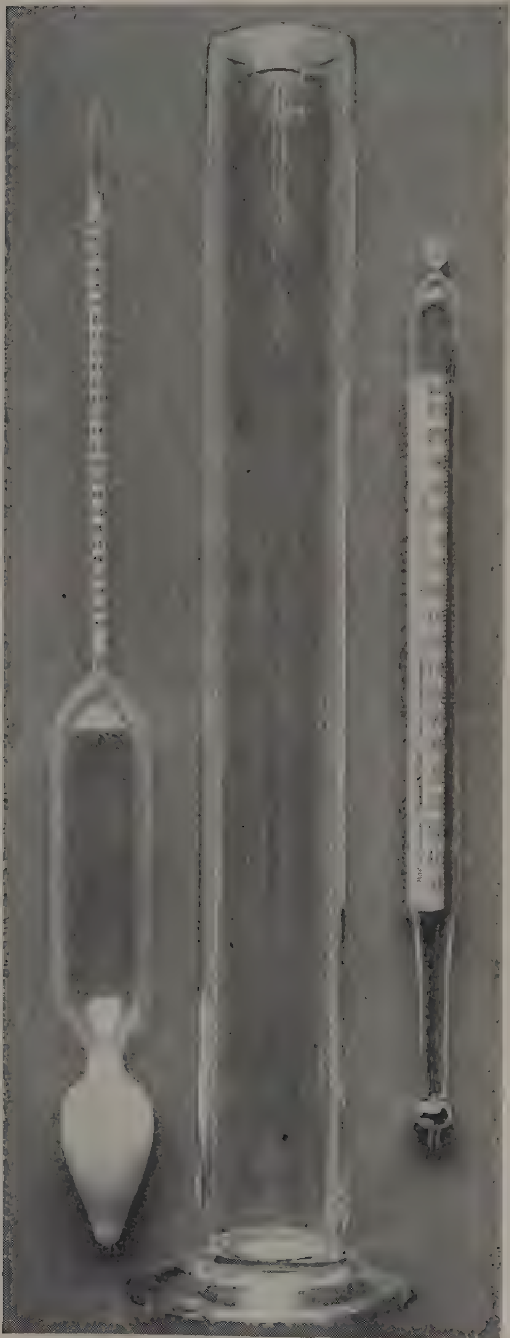

Plate 129.
A QUEVENNE LACTOMETER, GLASS CYLINDER, AND DAIRY THERMOMETER.

(3) *Thermometer.*—If the Quevenne lactometer is used, an ordinary Fahrenheit dairy thermometer will be required. If the density hydrometer is used, a centigrade thermometer is preferable, although not essential.

Making the Readings.

If the milk shows no signs of churning the only precaution to be observed is to adjust the temperature to between 50 deg. F. and 80 deg. F. preferably between 60 deg. F. and 70 deg. F. If the milk has been chilled

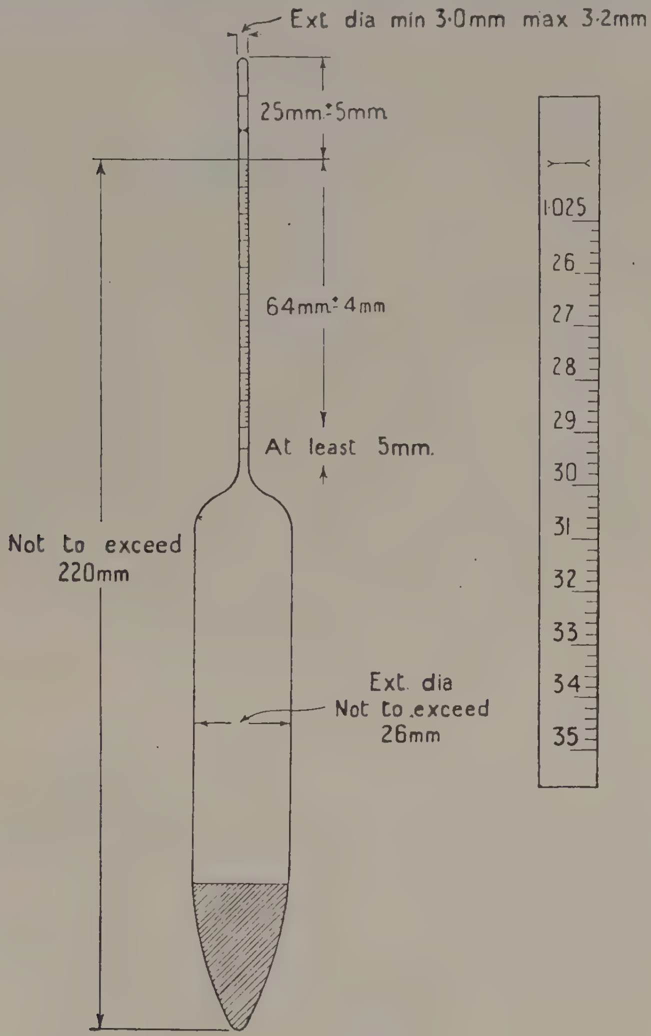

Plate 130.

BRITISH STANDARD DENSITY HYDROMETER FOR USE IN MILK, SIZE No. 1.—Reproduced by permission from British Standard Specification No. 734—1937.

it is advisable to warm it up to a temperature of about 100 deg. F. and gently but thoroughly mix, then cool to about 70 deg. F. If the fat has been partly churned, it is essential to warm and mix as described. Do not mix so vigorously as to incorporate air bubbles, as this will make the reading incorrect. Sour milk cannot be tested.

Carefully pour the sample of milk into the cylinder so as to prevent the incorporation of air or formation of froth. The cylinder should be nearly filled, so that when the hydrometer is inserted the milk will

overflow. Hold the hydrometer by the top of the stem, lower gently into the milk, and release when in its approximate position of equilibrium. The stem above the liquid should not be wetted with the milk for more than $\frac{1}{4}$ inch, as the weight of the adhering milk will be sufficient to make the hydrometer sink further into the milk and cause an inaccurate

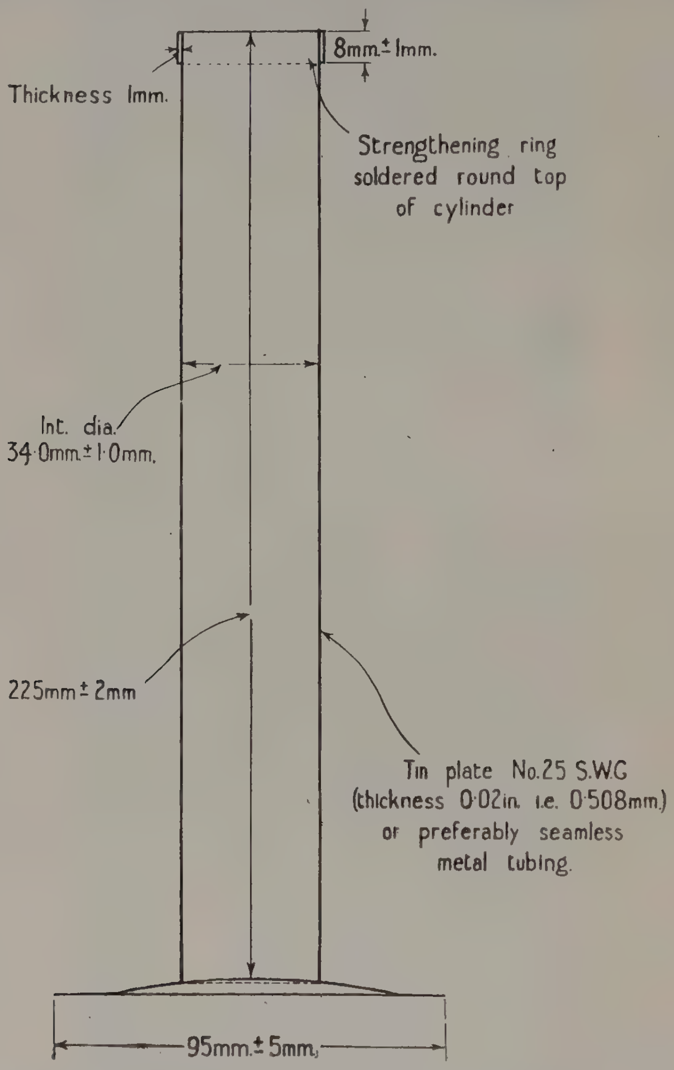

Plate 131.

CONSTRUCTIONAL DETAILS OF A METAL CYLINDER.—Reproduced by permission from British Standard Specification No. 734—1937. The dimensions given are for the British Standard Density Hydrometer, Size No. 1, and would require modifications for other instruments.

reading. When the hydrometer is at rest the scale reading is taken at the level surface of the milk, not at the top of the milk column around the stem of the hydrometer. To make the methods as uniform as possible the readings of the British standard density hydrometer may be recorded by omitting the digit and moving the decimal point three places to the right; for example, 1·0306 becomes 30·6 and so on. The

scale shown in Plate 130 shows that this is easily done. In this way the readings become comparable to the Quevenne lactometer degrees and the calculation of total solids is simplified. For the sake of simplicity they will be called "Density Degrees." Withdraw the hydrometer and immediately introduce a thermometer and record the temperature of the milk.

Corrections for Temperature.

The Quevenne lactometer is graduated to give correct readings at 60 deg. F. If the temperature is not 60 deg. F., a correction must be made to the reading. Table 1 gives the corrections which should be applied at temperatures between 50 deg. F. and 80 deg. F.

TABLE I.

Temp. °Fah.	Observed Lactometer Reading.												Temp. °Fah.
	16.	18.	20.	22.	24.	26.	28.	30.	32.	34.	36.	38.	
50	0·7	0·8	0·8	0·8	0·9	0·9	1·0	1·0	1·1	1·2	1·3	1·4	50
52	0·6	0·6	0·7	0·7	0·7	0·8	0·8	0·9	0·9	1·0	1·1	1·2	52
54	0·4	0·5	0·5	0·5	0·5	0·6	0·6	0·7	0·7	0·7	0·9	1·0	54
56	0·3	0·3	0·3	0·3	0·4	0·4	0·4	0·4	0·5	0·5	0·6	0·7	56
58	0·1	0·1	0·1	0·1	0·2	0·2	0·2	0·2	0·3	0·3	0·3	0·4	58
	Subtract from the observed lactometer reading.												
60	No corrections at this temperature.												60
	Add to the observed lactometer reading.												
62	0·2	0·2	0·2	0·2	0·2	0·2	0·3	0·3	0·3	0·3	0·3	0·3	62
64	0·4	0·4	0·4	0·4	0·4	0·5	0·5	0·5	0·6	0·6	0·6	0·7	64
66	0·5	0·5	0·6	0·6	0·6	0·7	0·7	0·8	0·9	0·9	1·0	1·0	66
68	0·7	0·7	0·8	0·9	0·9	1·0	1·0	1·1	1·2	1·2	1·2	1·3	68
70	0·9	1·0	1·0	1·0	1·1	1·2	1·2	1·3	1·4	1·5	1·6	1·7	70
72	1·1	1·1	1·2	1·2	1·3	1·4	1·5	1·6	1·7	1·8	1·9	2·0	72
74	1·3	1·3	1·4	1·5	1·6	1·7	1·8	1·9	2·1	2·2	2·3	2·4	74
76	1·6	1·6	1·7	1·8	1·8	1·9	2·0	2·2	2·4	2·5	2·7	2·8	76
78	1·8	1·8	1·9	2·0	2·1	2·2	2·3	2·5	2·7	2·9	3·1	3·2	78
80	2·0	2·1	2·2	2·3	2·3	2·4	2·6	2·8	3·0	3·2	3·4	3·5	80
	16	18	20	22	24	26	28	30	32	34	36	38	

Corrections to be made to the Quevenne Lactometer readings to convert them to readings at 60° Fah.

The density hydrometer is graduated to give correct readings at 20 deg. C. (68 deg. F.), and Table 2 shows the corrections to be made for different temperatures between 15 deg. C. (59 deg. F.) and 27 deg. C. (81 deg. F.) when the fat ranges from 0 to 10 per cent.

TABLE II.

Temp. °Cent.	Fat Percentage.						Temp. °Fah. (nearest).
	0 Per Cent.	2 Per Cent.	4 Per Cent.	6 Per Cent.	8 Per Cent.	10 Per Cent.	
15	1·0	1·1	1·2	1·3	1·5	1·6	59
16	0·8	0·9	1·0	1·1	1·2	1·3	61
17	0·6	0·7	0·7	0·8	0·9	0·9	63
18	0·4	0·5	0·5	0·5	0·6	0·6	64
19	0·2	0·2	0·3	0·3	0·3	0·3	66
	Subtract from the observed reading.						
20	No corrections at this temperature.						68
	Add to the observed reading.						
21	0·2	0·2	0·3	0·3	0·3	0·3	70
22	0·5	0·5	0·5	0·6	0·6	0·6	72
23	0·7	0·8	0·8	0·8	0·9	0·9	73
24	1·0	1·0	1·1	1·1	1·2	1·2	75
25	1·2	1·3	1·4	1·4	1·5	1·6	77
26	1·5	1·6	1·7	1·7	1·8	1·9	79
27	1·8	1·9	2·0	2·0	2·1	2·2	81
..	0 Per Cent.	2 Per Cent.	4 Per Cent.	6 Per Cent.	8 Per Cent.	10 Per Cent.	

Corrections to be made to the British Standard Density Hydrometer readings to convert them to readings at 20° Cent. (68° Fah.).

Calculation of Total Solids and Solids Not Fat.

(*a*) From Quevenne Lactometer Readings:—The lactometer reading at 60 deg. F. and the percentage of fat having been determined, the total solids may be calculated by means of the formula of the noted English dairy chemist, H. Droop Richmond.

Total solids $= \frac{1}{4}$ lactometer deg. $+ 1\frac{1}{5}$ fat $+ 0{\cdot}14$.

Example:—

Fat = 4·2%
Observed lactometer reading = 30·8 at 68° F.
Correction (from Table I.) = Add 1·1
Corrected lactometer reading = 30·8 + 1·1 = 31·9
Total solids = $\frac{1}{4}$ of 31·9 + $1\frac{1}{5}$ times 4·2 + 0·14

$$= \frac{31{\cdot}9}{4} + \frac{6 \times 4{\cdot}2}{5} + 0{\cdot}14$$

$$= 7{\cdot}975 + 5{\cdot}04 + 0{\cdot}14$$

= 13·155. Recorded as 13·2%.

The solids not fat (S.N.F.) would be 13·2 − 4·2 = 9·0%.

(*b*) From Density Hydrometer Readings.—The formula used is based on that of H. Droop Richmond, but is slightly different because of the slight difference between density and specific gravity.

Total solids = $\frac{1}{4}$ density deg. + $1\frac{1}{5}$ fat + 0·7.

Example:—

Fat = 4·0%
Observed density degrees = 30·0 at 20° C. (68° F.)
Correction from Table II. = nil
Corrected density degrees = 30·0

$$\text{Total solids} = \frac{30{\cdot}0}{4} + \frac{6 \times 4{\cdot}0}{5} + 0{\cdot}7$$

$$= 7{\cdot}5 + 4{\cdot}8 + 0{\cdot}7$$

= 13·0%.

The solids not fat in this case is 13·0 − 4·0 = 9·0%

The figures obtained by the above methods may be applied at milk depots, cheese factories and butter factories for the following purposes:—

1. Detection of Watered Milk.

The legal minimum for total solids is 12 per cent. and for solids not fat is 8·5 per cent. This latter figure is lower than the average which is about 8·8 per cent. The formula given below is based on the average figure of 8·8 per cent., and therefore assumes, quite incorrectly, that all milks containing less than 8·8 per cent. of S.N.F. are adulterated with water. It should be clearly understood that milks which contain less than 8·8 per cent. of solids not fat are not necessarily adulterated, but they may be regarded with suspicion, particularly if the milk is from a herd of Jersey of Guernsey cattle, and to a lesser extent, A.I.S. or Ayrshires. If the S.N.F. are below 8·5 per cent. the milk is of illegal composition in any case and should quite correctly be rejected.

$$\text{Added water} = (8{\cdot}8 - \text{S.N.F.}) \times \frac{100}{8{\cdot}8}$$

Examples:—

(*a*) Fat = 4.2 per cent. Total solids = 13.2 per cent. S.N.F. = 9.0 per cent.

The S.N.F being above 8·8, the milk is not considered to be adulterated with water.

(*b*) Fat = 3·5%. Total solids 12·0%. S.N.F. = 8·5%.

$$\text{Added water} = (8{\cdot}8 - 8{\cdot}5) \times \frac{100}{8{\cdot}8} = 3{\cdot}4\%.$$

This milk may be genuine, but it is equally possible for it to be adulterated with about 3 per cent. of water.

(c) Fat = 3·8%. Total solids = 12·0%. S.N.F. = 8·2%.

$$\text{Added water} = (8{\cdot}8 - 8{\cdot}2) \times \frac{100}{8{\cdot}8} = 6{\cdot}8\%.$$

In this case it is more than probable that the milk is from a herd yielding milk with a high percentage of fat, and the supplier has added about 7 per cent. of water, but this was not sufficient to reduce the fat or total solids below the legal minima. The added water has, however, reduced the S.N.F. to below the legal minimum. Such milk should be rejected.

As diseases, mastitis for example, are very conducive to a low solid not fat content, such milks should be regarded with very great suspicion from the quality standpoint as well.

2. Detection of Skimming.

Under this heading is included the addition of skimmed or separated milk, as well as the partial removal of fat. The standard for milk under the Dairy Produce Acts (Reg. 182 (1)) requires that the specific gravity of the milk solids shall be not higher than 1·35. To make this clearer, milk fat has a specific gravity of about 0·93 at ordinary temperatures, and the solids not fat have a specific gravity of approximately 1·62. A mixture of the two, therefore, has a specific gravity between these two limits. The removal of fat increases the proportion of the heavier solids not fat, and thereby raises the specific gravity of the total solids. The addition of separated milk has exactly the same effect. The addition of water does not affect the S.G. of the milk solids as the relative proportions of the fat and the solids not fat remains unchanged. When determined by means of the formula given below, the specific gravity of the milk solids of genuine milks usually ranges from 1·30 to 1·33, sometimes a little lower, but never higher than 1·34. If the specific gravity of the milk solids is from 1·34 to 1·35 skimming must be strongly suspected, while if higher than 1·35, skimming or the addition of skimmed milk has undoubtedly taken place. Such milk cannot therefore be accepted as whole milk, but must be regarded as skimmed milk and treated accordingly.

$$\text{Sp. Gr. of solids} = \frac{\text{Sp. Gr. of milk} \times \text{Total solids}}{\text{Sp. Gr. of milk} \times \text{Total solids} - (100 \text{ Sp. Gr.} - 100)}$$

Note:—(100 Sp. Gr. — 100) equals $\frac{1}{10}$ of the lactometer reading, and the formula may be more simply stated as—

$$\text{Sp. Gr. of solids} = \frac{\text{Sp. Gr. of milk} \times \text{Total solids}}{\text{Sp. Gr. of milk} \times \text{Total solids} - \frac{1}{10} \text{ of Lactometer reading.}}$$

Examples—(*a*) A normal milk.

Lactometer reading at 60° F. = 32·0. Fat = 4·0%.
Specific gravity of milk = 1·032
Total solids by previous formula = 12·9%. S.N.F. = 8·9%.

$$\text{Sp. Gr. of solids} = \frac{1{\cdot}032 \times 12{\cdot}9}{1{\cdot}032 \times 12{\cdot}9 - \frac{1}{10} \times 32{\cdot}0}$$
$$= \frac{13{\cdot}31}{13{\cdot}31 - 3{\cdot}20} = \frac{13{\cdot}31}{10{\cdot}11}$$
$$= 1{\cdot}316.$$

(*b*) A partly skimmed milk.

Lactometer reading at 60° F. = 34·0. Fat = 3·3%.
Specific gravity of milk = 1·034
Total solids = 12·6%. S.N.F. = 9·3%.

$$\text{Sp. Gr. of solids} = \frac{1{\cdot}034 \times 12{\cdot}6}{1{\cdot}034 \times 12{\cdot}6 - \frac{1}{10} \times 34{\cdot}0} = \frac{13{\cdot}03}{13{\cdot}03 - 3{\cdot}40} = \frac{13{\cdot}03}{9{\cdot}63} = 1{\cdot}353.$$

(*c*) A partly skimmed and watered milk.

Lactometer reading at 60° F. = 31·0. Fat = 3·0%.
Specific gravity of milk = 1·031
Total solids = 11·5%. S.N.F. = 8·5%.
Added water by previous formula = 3·4%.
(Actually this is a very conservative estimate of the added water).

$$\text{Sp. Gr. of solids} = \frac{1{\cdot}031 \times 11{\cdot}5}{1{\cdot}031 \times 11{\cdot}5 - \frac{1}{10} \times 31{\cdot}0} = \frac{11{\cdot}86}{11{\cdot}86 - 3{\cdot}10} = \frac{11{\cdot}86}{8{\cdot}76} = 1{\cdot}353.$$

The skimming is shown by the high specific gravity of the solids, and the watering by the low S.N.F. This milk, of course, is also deficient in total solids and fat while the solids not fat are the bare legal minimum.

(*d*) A sample of separated milk.

Lactometer reading at 60° F. = 36·0. Fat = 0·10%.
Specific gravity of milk = 1·0360
Total solids = 9·26%. S.N.F. 9·16%.

$$\text{Sp. Gr. of solids} = \frac{1{\cdot}036 \times 9{\cdot}26}{1{\cdot}036 \times 9{\cdot}26 - \frac{1}{10} \times 36{\cdot}0} = \frac{9{\cdot}59}{5{\cdot}99} = 1{\cdot}60.$$

3. Determination of Fat Losses in Buttermilk.

A news item entitled "What is a Fair Over-run?" which was distributed to the Press by this Department in April, 1938, contained this statement—"The percentage of the total fat lost is approximately 1 per cent. in the buttermilk. . . . " This has been questioned by more than one factory manager as being an excessively high loss, but actually it is very conservative. It was calculated from the 1934-5 results of about 800 analyses of buttermilks from 37 Queensland factories. It was used along with other conservative losses as a means of demonstrating that the maximum over-run obtainable is in the vicinity of 2 per cent. Since these buttermilks were analysed there have been a large number of modern pasteurisers installed which have undoubtedly raised the fat losses above the 1934-5 figures. McDowall (2) quotes fat losses ranging from 0·96 to 1·73 per cent. for a number of New Zealand factories. The quoted loss of 1 per cent. is, therefore, seen to be as low as can be expected with careful factory methods. This loss should be regarded as unavoidable in the same way as the loss of about 2 per cent. of the fat during separation is unavoidable. Carelessness or rush methods, particularly high churning temperatures, and the churning of freshly pasteurised cream, can greatly increase this loss of fat.

Methods of determining the fat losses in buttermilk involve the determination of total solids by the methods given previously. The preliminary stages are:—

(1) Collect a sample of buttermilk preferably as it is run from the churn. The sample may, with considerable advantage, be a composite sample from every churning of butter made during the day.

(2) Determine the percentage of fat by the normal butyl alcohol method.

(3) Determine the lactometer reading and temperature.

(4) Make the necessary correction for temperature, and determine the percentage of total solids by the methods already given, then determine the solids not fat.

(5) Determine the percentage of fat in the unwatered buttermilk by means of the formula:—

$$\text{Fat in unwatered buttermilk} = \frac{\text{Fat} \times 8{\cdot}8}{\text{S.N.F.}}$$

Example:—

Fat in composite sample of buttermilk = 0·62%
Lactometer reading at 56° F. = 22·0°
Lactometer reading corrected to 60°F. = 22·0 − 0·3
= 21·7.

Total solids = $\frac{1}{4}$ of 21·7 + $1\frac{1}{5}$ times 0·62 + 0·14 = 6·31%
Solids not fat = 6·31 − 0·62 = 5·69% or 5·7% (to nearest 0·1%)

$$\text{Fat in unwatered buttermilk} = \frac{0{\cdot}62 \times 8{\cdot}8}{5{\cdot}7} = 0{\cdot}96\%.$$

(As an item of interest the percentage of added water may also be determined by the method given previously, and in the above example will be found to be 35 per cent. This water is added in various ways, such as can steamings, water used to standardise the cream to the desired fat percentage, water used to dissolve the neutraliser, rinsings of neutralising and holding vats, steam condensed during pasteurisation with live steam, break water, &c.)

Unwatered buttermilk is really the non-fatty portion of cream as it is received at the factory. The total quantity of cream received is obtainable from the factory books, and, provided the average percentage of fat in this cream is known, the total quantity of unwatered buttermilk received can be found. Unfortunateiy, the 8·8 ml. pipette method of testing cream, which is used in Queensland, does not give the true fat percentage, the test being about 1 per cent. low for a 35 per cent. cream and 2 per cent. low for a 45 per cent. cream. The result is that the quantity of buttermilk apparently received at the factory is overestimated. For example, a cream giving a 35 test would presumably contain 65 per cent. of buttermilk, but actually the true fat is about 36 per cent. and the buttermilk only 64 per cent. The error, introduced by the inaccurate method of testing, can be offset by assuming that less of the buttermilk is lost, that is, that more of the buttermilk is incorporated in the butter than is actually the case. The average curd in Queensland butters is a little less than 0·8 per cent., and is equivalent to approximately $8\frac{1}{2}$ per cent. of incorporated unwatered buttermilk. By assuming that butter contains 10 per cent. of incorporated buttermilk, the original error of the 8·8 ml. method of

testing is largely eliminated. This is an example of a deliberately introduced compensating error allowable only in this case because of the original error introduced by the inaccurate method of testing.

Without going into details of the considerations and calculations involved which have been excellently set out in a recent circular (3) from the Council for Scientific and Industrial Research, the percentage of all fat lost in the buttermilk can be very closely approximated by *multiplying the fat in the unwatered buttermilk by the following conversion factors* worked out by Udy in 1929 in New Zealand and reproduced as Table 2 of the C.S.I.R. circular. These factors are based on butter containing 10 per cent. of unwatered buttermilk.

Fat Test of Cream as Received at Factory.	Conversion Factor.	Fat Test of Cream as Received at Factory.	Conversion Factor.
35	1·73	41	1·32
36	1·65	42	1·26
37	1·58	43	1·20
38	1·51	44	1·15
39	1·44	45	1·10
40	1·38		

Example (Continued).

Fat in unwatered buttermilk = 0·96%
Average fat test of cream as received = 41
Fat lost in the buttermilk = 0·96 × 1·32 = 1·27%.

It is hoped that the methods outlined will enable managers of milk depots and cheese factories to check illegal practices by unscrupulous suppliers. Managers of butter factories should be able to determine the extent of their fat losses in buttermilk and a realisation of their extent should be sufficient to make them realise that other losses require to be kept as low as possible. Possible sources of loss which can be checked are spillage during handling of the cans, waste from the cream samples, leakages, splashing from the coolers, loss of froth, extra butter given away in each box during packing, and most prolific source of loss of all, the extra fat given away by low percentages of water and/or salt in the butter.

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2. McDOWALL, F. H. N.Z. Jour. Sc. and Tech., 1938. 19, 682.
3. WILEY, W. J. C.S.I.R. (Div. of Animal Health and Nutrition). Information Circular No. 2, "Butterfat Losses in Churning," 1939.

A MILK TRAVEL TEST.

As an experiment a can of milk was recently railed from a place 80 miles from Pretoria (South Africa) to Durban and then back to a dairy in Pretoria—a distance of just under 1,000 miles in sixty-three hours. At the end of the long journey to and fro, the milk was declared fit for consumption. When the milk arrived at Durban on the outward journey, it was tested and passed as first grade. At no time was any special care given to the can by the railway people.

The experiment was sponsored to prove that the keeping quality of milk depends, above all, on the method of production and careful attention to cleanliness in the milking and handling.

The Lasting Effects of Molasses used as Fertilizer.*

C. G. STORY.

MOLASSES as a fertilizer has a particular value on potash-poor red volcanic soils, because of the richness of the by-product in this plant food. But it has also been found that molasses applied to such soils, in dry areas, also brings with it another benefit, particularly when weak-rooting canes such as Q. 813 are grown. It would appear that the molasses destroys the influence of root parasites which often exist under such conditions, and the weak-rooting cane gives a normal ratoon yield.

Plate 132.

ILLUSTRATING THE LASTING EFFECTS OF AN APPLICATION OF MOLASSES.—Its influence is shown on a crop of Poona pea planted after the ratoons were ploughed out. *Left,* plant from "no molasses" plot; *right,* plant from "molasses" plot.

The results of an application of molasses to a ratoon field of Q. 813 in the Woongarra area were reported in the Quarterly Bulletin of January, 1939, page 121. The yield figures are particularly interesting, and should be studied by all farmers on soil of this type. It was con-

* From *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), July, 1939.

cluded that an application of 5 tons of molasses, together with mixed fertilizer supplying an equal amount of plant-foods, was better than 10 tons of molasses alone.

After this crop of cane had been harvested, the farmer ploughed out the area, and broadcast Poona pea as a cover crop, in October last. Particular notice was taken of the growth of the pea crop to see whether the molasses treatment showed any "carry-over" effect. In every instance it was found that the growth of the legume on the plots which had received 10 tons of molasses a year earlier was far in advance of that on the "no treatment" plots. A comparison of the respective growths is illustrated in Plate 132, the photograph was taken in January, three months after planting. During this growth period 7 inches of rain had fallen.

The benefits enjoyed by the pea crop growth can probably be credited to the abundant supply of potash provided by the molasses, which was not entirely used up by the ratoon cane. It can be expected, of course, that the effect will be seen also in the next crop of cane which is to be planted on the field this year. Therefore, in calculating the value of any beneficial soil treatment, the farmer should consider not only immediate results, but allow also for the more permanent effects as well. On the trial in question, the Q. 813 ratoons showed a gain of 6½ tons of cane per acre where 10 tons of molasses per acre were applied.

A SIMPLE FARM LOADING RAMP.

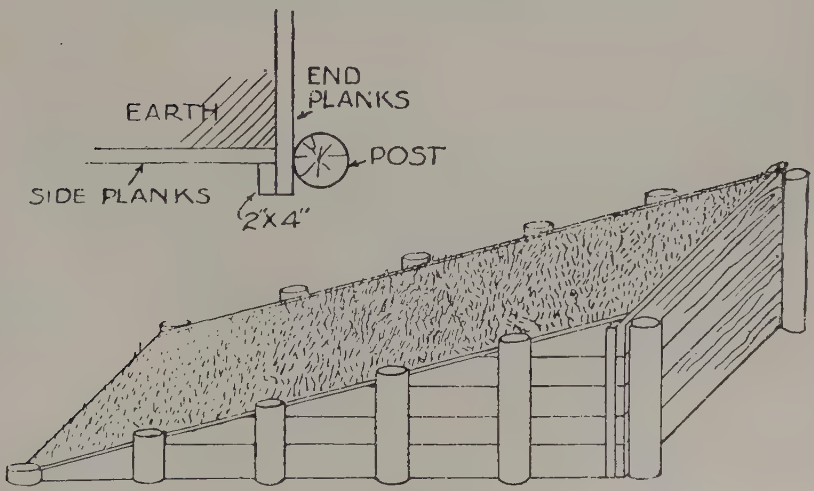


Plate 133.

This drawing gives an idea of how a loading ramp for tractors and other machinery and livestock can be constructed. Reinforced concrete may be used instead of posts and planks. In any case, the side walls should be anchored together with wire, cable, or rods. Even concrete will be broken at the corners if not well reinforced and anchored.

Corn, Downy Mildew, and Cane.*

ARTHUR F. BELL.

OFFICERS of the Bureau have at all times advised against the growing of corn in the vicinity of cane fields on account of the danger of increasing the spread of mosaic disease. This danger arises from the fact that mosaic disease is spread by a small insect, the corn aphis, which breeds prolifically on corn and sorghum, but does not breed on cane. Obviously, then, the growing of corn or sorghum near cane will breed a large stock of these aphids which migrate on to the cane and so spread the mosaic.

Recently there has become evident another and much stronger reason why corn should not be grown in the vicinity of cane, and this particularly applies to Southern Queensland at the present time. The sugar industry in Southern Queensland has been rehabilitated by the growth of varieties which are highly resistant to the once terrible scourge, gumming disease. It so happens that the two most important of these varieties, P.O.J. 2878 and P.O.J. 213, are highly susceptible to downy mildew, a disease which was almost non-existent in the southern districts at the time of their introduction.

Unfortunately the climatic conditions over the past three years have been eminently suited to the continued and late spread of downy mildew in the Bundaberg district, and we now must face the position where the continued cultivation of P.O.J. 213 and P.O.J. 2878 is seriously threatened, at least in the Woongarra area.

Scattered outbreaks of this disease occurred last year. In searching for the origin of these outbreaks it was found that in some cases they had obviously originated from a source of infection carried over in one of the old varieties; in other cases, however, there appeared to be no such source of infection. Closer examination then revealed the fact that near most of the latter fields we could find corn which appeared to be affected with a downy mildew disease.

We then carried out investigations of this aspect of the problem, and we have now found that corn is very easily infected with exactly the same downy mildew disease as cane and that cane can become infected from diseased corn. It might be mentioned here that on cane the spores or "seeds" of the fungus which causes downy mildew disease are produced only on the lower surface of the leaf, whereas on corn they are produced in vast numbers on both sides of the leaves. Because corn grows so much faster than cane the disease develops much more rapidly; a block of even a very susceptible variety of cane will normally take not less than a couple of years to become 100 per cent. infected, but corn becomes 100 per cent. infected in a few weeks.

Even if the corn were healthy when planted, it would still be very dangerous in the event of a single stool of diseased cane being near it. In the absence of corn the disease would gradually spread through the cane from this single stool, but by careful inspection and digging out of diseased stools as soon as they appeared the disease could be brought under control. It would be a different story if there were a block of

* From *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), July, 1939.

corn alongside; this would become infected from the single stool of diseased cane and the disease would go through it like wildfire. Then, instead of the cane being exposed to infection from one or two stools of cane, it would suddenly become exposed to infection from hundreds of stools of corn and the rate of spread in the cane would be greatly accelerated.

In view of these findings it appears necessary that steps will have to be taken to prohibit the growing of corn in cane areas and farmers would be well advised to seek some suitable alternative fodder crop. Our experience to date indicates that sorghums are much less susceptible to downy mildew than corn. In the coming season it is proposed to test the downy mildew resistance of a number of grain sorghums. Grain sorghums in the United States yield some remarkable results and leading varieties have recently been imported by the Queensland Department of Agriculture. Should these prove resistant to downy mildew they would make excellent substitutes for corn *in those areas where mosaic disease is not a problem.* Where mosaic disease is likely to be a serious problem, the growing of sorghum of any kind must be condemned, as it always has been..

TO ANCHOR A CORNER POST.

Here is one of the very best ways of anchoring a corner fence post to enable it to stand the strain of tightly stretched wires. The method really anchors three posts at the corner.

Set three sound posts in the usual way—the corner post and one in each fence line running from it. Six or eight feet back of the corner post and in line with each fence direction dig a hole large enough and deep enough to bury a non-decaying deadman, such as a large rock. About 3½ feet from the ground, tie a strong, double wire to each second post and run it to the deadman. Bury the deadman and tamp down firmly. The deadman should be so placed that the stay-wire enters the ground at or near the corner post. Place a strong rail or other timber between the second post and the corner post at about the height of the anchor wires. Then with a stick between the two halves of the double wire, twist until it is tight. Fasten the stick so the wire will not untwist.

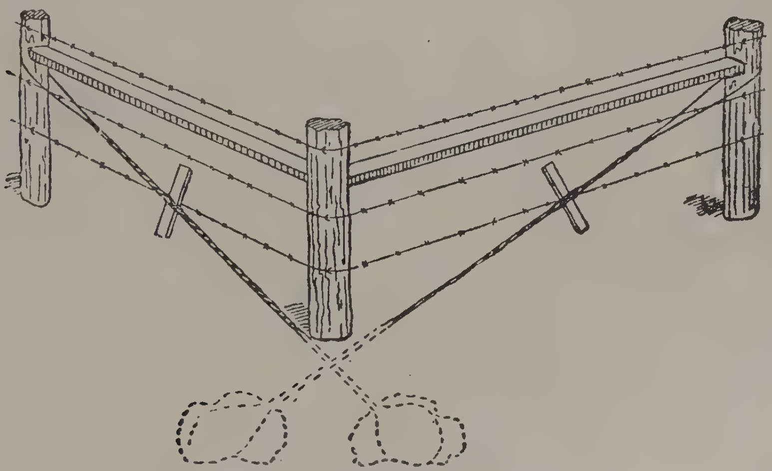


Plate 134.

This method of corner anchoring has the double advantage of giving the corner post anchorage and preventing the tendency to lift out when it is braced to the bottom of the second post, which is so often done. It gives three points of strength —the corner post, the second post, and the deadman.—*New Zealand Farmer.*

A Mound-building Ant Affecting Sugar-cane.*

F.M.N.: Aphaenogaster longiceps, Sm ?

R. W. MUNGOMERY.

OCCASIONALLY after a period of minor activity, during which time certain pests cause little damage, they suddenly increase and assume pest proportions, over-running larger areas than those previously occupied by them, and they thus cause a certain amount of apprehension. These pest outbreaks are largely governed by varied weather conditions which intimately affect the insect itself, its parasites, or its environment.

This, in effect, is what has happened recently in the case of a mound-building ant which has, for a number of years, been regarded as a cane pest of rather limited activity. During the last year, however, it has caused some concern to growers in the Tully area, and to one or two growers at Mourilyan, and has necessitated control measures being instituted against it.

So far as is known, at least two very similar species of these mound-building ants exist in Queensland canefields, and similar damage occurs in such widely separated districts as Tully, Sarina, and Bundaberg.

The ants in question are medium sized, about one-fifth of an inch in length, and of a pale brownish colour. They live in underground nests, and their small entrance mounds are conspicuous around the base of affected cane stools, but the ants themselves are not so readily seen, since during the daytime they mostly skulk in their underground tunnels and their main mound-building activities are carried out during the night. Frequently a mound that has been destroyed during the day will have its entrance rebuilt during the following night, and the normal functions of the nest will proceed as before. These ants can be readily unearthed with a spade, and then they are seen in different parts of their underground communications.

The chief damage which these ants cause to the cane stools is a severe stunting, brought about by the enormous amount of tunnelling and honeycombing of the soil beneath the cane stool. This causes drying out of the soil, and in addition there is also a certain amount of mechanical injury sustained by the tiny root hairs, thus depriving the plant of a portion of its normal supply of plant foods and moisture. As far as we are aware these ants do not actually eat the root hairs—at least no root debris has been found whenever an examination has been made of their stomach contents. Rather do they colonise very small hoppers and aphids on the cane roots, and in return for this attention the aphids give off a honey dew which is eagerly sought after by the ants, and this appears to be the real reason why these ants construct their nests underneath the cane stools.

Similar mound-building activities are to be seen on some of the uncultivated lands, and exactly the same state of affairs occurs there with the one exception that in this case the aphids colonise on blady

* From *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), July, 1939.

Imperata arundinacea

grass roots, &c., and it is from these uncultivated lands that the pest frequently makes inroads into the adjacent canefields, and once established there causes the grower considerable embarrassment.

Where these waste lands are extensive, the pest obviously cannot be economicaly eradicated from those areas, but an attempt can be made to keep the cane lands as free as possible. This should begin when the ratoons are ploughed out. Care should be taken not to leave volunteer stools or grasses grow on the ploughed-out fields. Otherwise these become hosts for the aphids and hoppers, with the consequent persistence of the ant pest.

The aim should be either to bare fallow the land, or else it should be sown heavily with a suitable leguminous crop, capable of growing quickly and choking out any foreign weed or grass growth. Later when this crop is ploughed under, the area should be looked over carefully to make sure that no ants' nests remain, and if they do, the ant colonies should be further harassed either by ploughing or by fumigation.

When the ants commence to invade young plant cane or ratoons recourse must then be had to the use of soil fumigants, and in this respect carbon bisulphide, or a mixture of carbon bisulphide and paradichlorbenzene, such as is used for the fumigation of cane crubs, will probably be found the most useful. Since the mounds vary so much in size and depth, the amount of fumigant to be used will necessarily vary considerably, but as the infested stools are mostly honeycombed underneath, they should be fumigated much in the same manner as when fumigating cane grubs, i.e., injections with a Dank's injector using the full charge, and approximately 15 inches apart. Preferably the injections should be made deep. In the case of ants inhabiting large nests with deep ramifications, these are not always destroyed in the first injection, and whenever this happens the survivors will have dumped their dead outside the mound entrance. In such a case it will be necessary to repeat the fumigation.

A HANDY GATE.

This combination gate works almost the same as other gates except that it will open two different ways. It has proved very helpful when separating the calves from

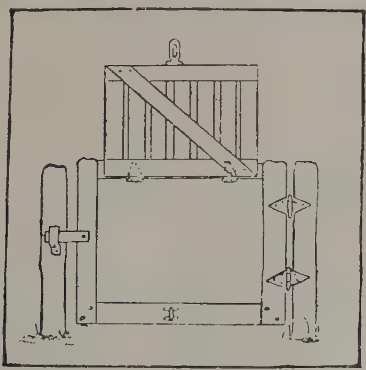


Plate 135.

the cows or trying to run them in the pen with the cows. You can open the top part and the calves can go in, but the cows cannot get out.

The Brisbane Exhibition.

BRISBANE's August Exhibition has such a strong appeal that people come every year from all over the Commonwealth to see it, as well as to bask in the glow and glamour of Queensland's glorious spring. The show is a breeder of optimism, as well as an exemplar of opulence, and a visit to it is one of the best cures for pessimism. To see the work of hand and brain so well displayed is to realise that Queenslanders are, as yet, only on the edge of opportunity, and to confirm a lively faith in the future of the State.

At this year's show was seen the wealth and progress of Queensland in parade, pageant, and panoply. There it was learnt that Queensland's land industries produced more than £50,000,000 worth of new wealth last year, and that enormous aggregate was represented in every form at Bowen Park. But striking as those figures are, they become far more impressive when placed alongside the actual samples of production of farm and grassland—the production of broad acres of untold fertility and of illimitable pastures of richness unsurpassed.

Here are some of Queensland's income figures (approximate):—

	£
Sugar-cane	12,000,000
Wool and other station products	11,000,000
Dairying	10,500,000
Beef cattle	7,250,000
Grain crops	1,600,000
Fodder and other crops	3,000,000

Outstanding Displays.

Among the big pavilion displays were the Court of Agriculture, containing a comprehensive representation of all the agricultural and pastoral activities of the State; the District Exhibits from the North Coast and Tabelands of New South Wales, Wide Bay and Burnett, South Coast and Tablelands, West Moreton and Tablelands, Kingaroy, Mackay and Charters Towers, Oakey, Nanango, Darling Downs, Crow's Nest, and Caboolture; the Forestry Court, with its wealth of Queensland timbers; and the General Post Office display, showing a network of communication covering the world with electric power.

The Meat Industry Hall, the Hall of Dairying, and the Hall of Sugar were grouped in another part of the ground, and each was an exhibition in itself.

The Farm Boys and Farm Girls' Camps were other great features—perhaps, the most important of all, for what finer crop could any country have than its young people—in whose hands is literally the future of the Commonwealth?

Our Wealth in Wool and Sheep.

Merino and crossbred wools, greasy-grey from the shears and snow white from the scour, were piled in fleecy billows to demonstrate how warmly—literally and financially—we are covered with the sheep's overcoat. Australia has one-sixth of the world's sheep, and produces one-fourth of the world's wool—could there be stronger evidence of the success of scientific breeding and sound station management?

Fat lamb raising has made remarkable strides in Queensland. It is a matter of choosing the right classes, the right country, and applying the right methods, particularly in respect of the right way of feeding and the right way of preparing lambs for market and the right amount of care in delivering them.

The show authorities are taking a keen interest in this new industry, and so we had this year classes for British breeds of sheep for the purpose of crossing with the merino for supplying a promising export trade. Corriedales also are used in crossing with merinos to produce the right type of ewe for fat lamb breeding.

The Wool Hall at the show was full of interest. The sheep-shearing contest attracted some of the ''gun'' shearers of the Woolly West, and the celerity with which they peeled off the ''patient's'' overcoat with their ''mowing machines'' was a sight to thrill—and there were no ''tommyhawking'' or ''fribs'' or ''second cuts'' either. In the hall all the processes through which the wool goes from the time it is taken off the sheep's back to the manufactured garment were demonstrated.

If an opinion may be risked on the subject in which mere man must show his gameness in discussing (or is it just foolhardiness?) one of the best ways of increasing opportunties for the wool industry is to ask (we dare not insist!) our womenfolk to wear more wool. The average woman wears less and buys more, but, unfortunately, from the wool man's point of view, new synthetic fibres make up much of the additional purchases. It is a matter of style, perhaps, let alone comfort, but it is supposed that style is the more important.

It so happens that in Europe wool is now worn more than formerly, and in Paris and London woollen fabrics are as chic and smart as those of artificial silk and cotton. There is no reason why Australian women, especially as wool is such an important factor in Commonwealth economy, should not follow such a good example. What is required in all these things is a realisation of the value from the standpoints of fashion, utility, and economy of the home-grown product.

One of the best ways of serving Australia at the present time is to wear more wool.

To-day there are 22½ millions of sheep running on Queensland pastures, and they produce wool to the value—in round numbers—of £10 000,000, to say nothing of the returns from mutton, fat lambs, and other pastoral products.

The Cattle.

There is no finer stock show, in point of quality, than that seen every year at the Brisbane Exhibition. This year the daily stock parades demonstrated in a wonderful way what Queensland breeders have done in stock improvement. There they were—Herefords, big-framed ''ballies,'' sleek to look at, and with hides elastic to the touch; great shorthorns, full-ribbed, broad-backed beauties, square on top and underline; Aberdeen-Angus, round-barrelled and built close to the ground, with beef to the fetlock and without the semblance of a ''boxing glove'' at the tail butt.

Fatteners provided the best mustering for many years. All classes were even, and showed a general excellence in early maturity, conformation, depth, and evenness of fleshing.

Stock can only be judged on a basis of utility, whether on the hoof or on the hook, and this year's fat cattle entries probably satisfied the hardest-headed judge, whether he viewed them from the top rail or inside the arena.

The cattle industry is worth £7¼ millions to Queensland, and, with improved herds and pastures, Queensland beef will run wool very close in annual value before many years have passed.

Great things come from small beginnings, and that was a square-hitting fact when the display in the Meat Hall was viewed. Since 1934, chilled beef export figures have risen from between 2,000 and 3,000 tons to over 28,000 tons—last year's shipments—a fine achievement in four years. The figures for this year are not yet available, but a possible near-future rise to 40 000 tons is a safe prediction, if present quality is maintained.

Throughout the stud beef cattle stalls there was noticed a trend towards a carcase shorter in the leg, with a deeper selvedge of flesh, and heavier flank and lower thigh. This is the type both butchers and shippers are looking for. In the polled cattle sections, all breeds showed a great improvement in quality.

It is good to think that Queensland graziers are on the road to a strong revival in the cattle industry as a result of planned organisation, and, it is hoped, better economic conditions.

In respect of chilled beef, the present position is that practically every technical difficulty has been overcome, and the chief thing required now is for cattle suitable for chilling to be in continuous supply. The cattle-fattening experiments at present in progress on our tropical coastal country have become, therefore, a matter of first importance. Likewise, fattening on the brigalow country reclaimed in recent years from prickly-pear.

From the beef-cattle camp to the milking-cow yard is only a stride, for, after all, our dairy breeds of cattle were evolved from beef breeds at one time or another.

With the dairy cows of every breed we have in Australia at the show—the A.I. Milking Shorthorn, Jersey, Friesian, Guernsey, and Ayrshire—it was a case of beauty and the bucket, and both were winners, a happy combination of show-ring shapeliness and cream-can value.

There were present teams from all the well-known dairy herds, of which the progeny are paraded in every show-ring in Queensland and at other royal shows in the Commonwealth.

In the ring and in the stalls one was able to learn more about selecting and judging a beast than he would in a long term of text-book study. There was seen the cow that filled the bucket as well as the eye, and it was possible to appreciate the skill of the breeder in combining all the points of a healthy, true-to-type animal with good performance in the milking bail.

"You would not see a better collection of these cattle paraded anywhere else in the world," said Mr. Arthur Snell, of South Australia, judge of the Australia Illawarra Shorthorns at the show.

From Beef to Butter.

The exhibit in the Meat Hall was one of the most attractive of the whole show, particularly to the housewife who prides herself on her ability to choose a chop or a breakfast steak—that was the opinion of a

mere man who knows only enough about butchering to knock a chop off a grid-iron.

From beef to butter was a skate, so to speak, or a slippery slide along a well-greased way. In the Dairy Hall across the road from the Meat Hall, the story of the State's progress was told in butter. It is not so very long ago when it was impossible to obtain enough butter to complete a small cargo to Sydney. During the last twelve months, the dairy industry was worth more than £10,000,000 to Queensland.

The wheels of Queensland industry are lubricated with Queensland butter-fat.

"Queensland knows on which side its bread is buttered"—there was no doubt about the truth of that emblazoned slogan.

From every part of the Queensland dairy country, which extends for more than 1,000 miles along the coast and the near-inland regions from the Tweed to the Daintree, came these tempting boxes of butter in the Dairy Hall, and all of the highest quality.

Pigs on a Pedestal.

Pigs were on a pedestal at the show—figuratively speaking—in all their brilliantined glory. Tammies, Berks, Large Whites, and Welsh Saddlebacks held court continuously in the pens set apart for both pork and bacon classes. In the Berkshire breed there are now two recognised classes, or types rather—one coming from the original British strains, and the other from strains which Canadian breeders have tried to improve by increasing length, depth, and productivity, while still maintaining the recognised colour and utility of the breed.

The Pig Section was outstanding this year. Both porkers and baconers were among the finest specimens of their types, and showed how far our farmers have advanced towards perfection in pig breeding and feeding.

In the pens reserved for litters were seen lusty, stocky, shapely scions of the best pig families, each with a pedigree as long as the handle of a shovel.

In Queensland to-day there are 320,000 pigs. Half a million are converted to bacon and pork every year, and they return to the State rather more than a million pounds a year.

Bathed and barbered like a beauty chorus, "Denis" and his mates earned their show honours. But the fact that was most impressive is that the Queensland pig is a bacon factory on trotters.

Poultry.

And what would bacon be without the breakfast egg?

In its poultry industry, Queensland, like the rooster, has something to crow about. Five million dozen eggs, nearly, the Egg Board handled last year, and that was nowhere near the total production of the State. The net average price (all grades included) returned to the growers for eggs delivered to the board was nearly 1s. 2d. It is something to crow about, and it is not left to the rooster to do all the crowing.

And it was not all fuss and feathers in the poultry pens at the show. Anyone with an eye to avian grace and beauty would have found a lot of satisfaction in studying the types and classes of all the breeds—whether utility backyarders or fancy fowls—in the Poultry Pavilion.

In round figures, the poultry industry lays more than three hundred thousand pound notes every year for Queensland.

The "Cream" of the Countryside.

The District Exhibits might be likened to the cream of the country-side, for each was replete with the best samples of production from a rich region, and each was an epitome of the whole show.

These exhibits demonstrated strikingly how the town depends on the country and the country on the town. Side by side with the products of the farm were the products of the factory, all eloquent of the enterprise of every section of the community. The importance of the farmer as a producer is admitted, but these regional displays also emphasised the importance of the farmer as a consumer as well. There is no finer example of the wedding and the welding of primary industry with secondary industry as presented by these annual district displays.

West Moreton and Tablelands won the A Grade competition for the eleventh time in the last twelve years. South Coast and Tablelands was second again, and, for the third time, North Coast and Tablelands of New South Wales took the tertiary honours. Wide Bay and Burnett was fourth. Included in the products—and all came up to the highest standards of farming and manufacture—were pastoral and field products, foods raw and processed, fruits and vegetables in almost bewildering profusion, minerals and building materials, manufactures and examples of trade skill, and, in each exhibit, the wine of the country—and, of course, Bundaberg and Beenleigh rum came under that category (though there was no sample of "Banyan" rum, which is said to be the best bait for the big-game fisherman!)

In the B Grade competition, Northern Downs won the trophy from Mackay and Charters Towers, with Kingaroy third.

In the District Farm Competition, Crow's Nest beat Caboolture. Woombye won the honours for the District Fruit Display.

The richness and range of productivity of Queensland, of which these district exhibits were representations in miniature and the "cream" of the countryside, were demonstrated strikingly in every display.

The show this year was remarkable from a farmer's point of view for the deepening interest in fodder cropping and conservation. Every district exhibit had a hay and ensilage section which compelled attention, both for quality and presentation.

Everywhere farmers are planning to reduce seasonal risks and storing stock food in one form or another. They know that the best results are to be obtained from grazing and dairy herds by conserving valuable natural foods for a dry time. They realise that a silo combines more profitable points than any other building on a farm. They appreciate the fact that ensilage can be made without weather worries.

Reviewing the astonishing array of farm crops, and looking beyond to the displays of wider range, and thinking of the men and women who produced them, it is realised that this great show serves two great ends—the stimulation of increased efficiency and the bringing to the people of the city a broader knowledge of the resources of the State in which all have a share, and in the development of which all have at least some responsibility.

In the Court of Agriculture.

What the Brisbane Show is to Queensland, the Court of Agriculture is to the Brisbane Show. The first thought on entering the Court was the predominant productivity of our soils.

The farmer is the only man who takes the elements God put on earth and turns them into new products. The sunshine and the soil, the dew drops and the rain drops, and seeds containing a little germ called life—these, with his plough, are his raw materials. Food, clothing, and shelter for mankind are the results. Who can resist the miracle of, say, the transmutation of sown pastures, green and lush in the flush of growth, into minted gold?

In the court were displayed native and sown pastures from which comes 80 per cent. of Queensland's living,

The dictum of the psalmist—All Flesh is Grass—learnt by heart at Sunday School, came vividly to mind when looking over the livestock exhibits at the Show. Nor was it allowed to be forgotten in a survey of the exhibits in the pavilion—the displays of the farming districts and the court of the Department of Agriculture. There was seen the whole range of our grasses—both native and introduced—in great array, and which form the basis of national prosperity.

At one time farmers looked on grass simply as a cheap stock food provided by bounteous Nature for their benefit, and not a crop that called for cultivation and care of any kind. To-day, thanks to science, we are better informed. Grass is now regarded as our most important crop, and that was evident by the prominence given to native grasses—such as Mitchell, Flinders, blue, and kangaroo grasses—and sown grasses—like paspalum and Rhodes—in every agricultural exhibit, both small and large. And that accounts, too, for a growing "grass consciousness" in every part of the State, which is remarkably fortunate in the variety, nature, and nutritional value of its native pastures. Grass is the best and cheapest food for the milking herd—it is grass and the quality of the cows that count in terms of butter fat.

Wool in crimpy staple with the yellow of the "yolk" glistening on its fibres, topped with scoured fleeces ready for the manufacturer, was eloquent testimony of the wonderful wealth of those pastures.

In an illuminated alcove were illustrations of the eternal war against animal diseases and pests; and adjoining was pictured the never-ending fight against the elusive microbe in the milk can.

Then was set out Queensland's harvest in miniature from her great grainlands, from which 8,500,000 bushels of wheat and millions of bushels of other cereals were garnered last season, and which were worth, in the aggregate, £3,000,000 in the bag.

Two models—one showing how soil is lost, and the other how soil is saved—were object lessons on the vital importance of conserving the top layer of the earth's surface.

Next was seen a demonstration of the practical side of fodder conservation with scale models of silos—trench, pit, stack, and tower—to show how it is done. All was framed with cocoa-coloured sheaves of grain sorghums—substitutes for maize in the drier areas with 90 per cent. of maize's nutritive value. Maize gets weak in the knees during a dry spell, and gives up the ghost rather easily when there is no rain at cobbing and tasselling time. The grain sorghums, on the other hand, take any amount of punishment, and return heavy yields of food for farm animals.

Then there was a tobacco section illustrating the importance of an industry which returns approximately £200,000 to growers every year. Queensland leaf is equal to the best that Australia produces.

In the cotton alcove was represented every phase of an industry which is increasing yearly in importance. Cotton brings in well over £450,000 annually to Queensland, and, like tobacco, this industry is only yet in its infancy. The value of a cotton-grass land rotation is recognised in every cotton-growing district.

Many uses have been found for the by-products of cotton, and these were shown in oils, meals, and other derivatives. The display was a fine example of the progress made in the industry and the value of cotton in our commerce and manufactures.

It was easily appreciated what sugar means to Queensland and the Commonwealth in the Sugar Hall. More than a tenth of the population of this State depends on sugar for bread and butter. An industry, worth annually about £12,000,000 to Queensland, has naturally a far-reaching economic and social influence, and, apart from the excellence of every section of the exhibit, that fact accounted to a large extent, probably, for the denseness of the daily throng in the Sugar Hall. There were seen a model sugar mill, with turning cogs and revolving rollers, and the whole process of sugar making from the green cane to glistening crystals, and all its other products. What do we not owe to the sugar industry? For national defence, every sugar mill in the North means a brigade of potential Diggers permanently garrisoned. The industry keeps ten thousand farmers in reasonably profitable production; it keeps more than 20,000 white Australian workers in constant employment. Estimate what it means to us socially, economically, and nationally—and then let us acknowledge our debt to the giant grass called sugar-cane.

In another alcove in the court, the continual war against vegetable pests and diseases was fitly represented. The question as to whether man or bug will inherit the earth may not yet be fully answered, but, judging by effective campaign and combat the bug is sure to be beaten.

In the Departmental Court, as well as in the Fruit Hall, fruits of all kinds make up the finest exhibit every staged at the Brisbane Show. And that is as it should be, for Queensland sells yearly the harvests of her orchard lands for £1,500,000. All the temperate, sub-tropical, and tropical fruits grown in the State were represented in the display—yellowing bunches of bananas, luscious pineapples, citrus fruits in pyramids of scarlet, gold, and amber, and rosy-cheeked apples from Stanthorpe, and all the other fruits for which Queensland is renowned throughout the Commonwealth.

Every exhibit in the Machinery Section was a pointer to agricultural prosperity along the modern mechanised road. They were striking examples of farming on wheels which add to the leisure, the income, and the culture of the farmer and his family.

Generally, a whole world of activity revolved around the Exhibition ground, and behind it all was the work of the farmer and his family. Beyond it all was the personal equation—the man in productive industry and the woman, too. It is their part in national service which makes up the wholesomeness, the attractiveness, and completeness of our national well-being.

The Brisbane Exhibition goes on from achievement to achievement, breaking yearly every record of entry and attendance. This Queensland institution, for it is nothing less, is one of the most impressive evidences of progress that could be presented to an appreciative community.

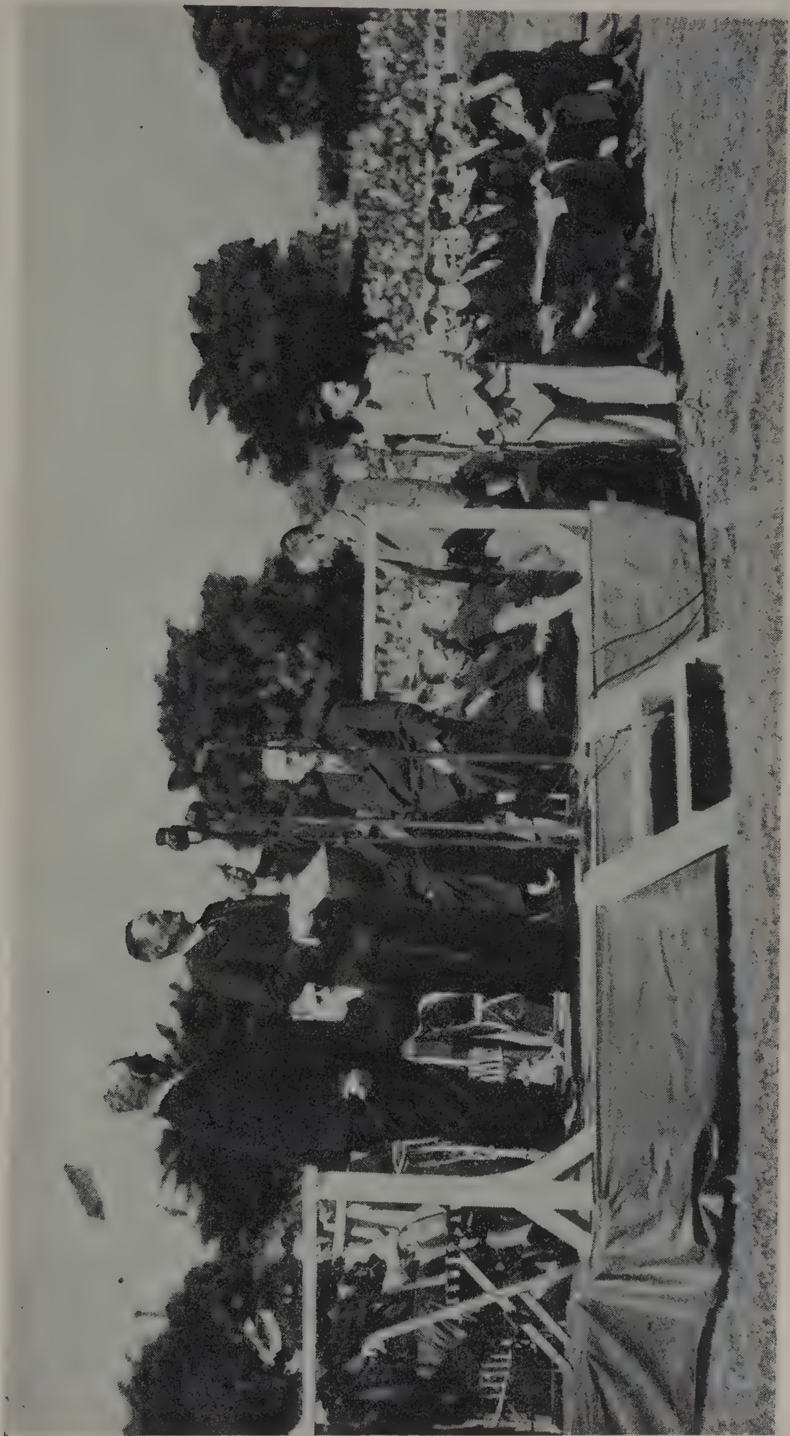


Plate 136.

HIS EXCELLENCY THE GOVERNOR (THE RIGHT HON. SIR LESLIE ORME WILSON) OPENING THE 1939 BRISBANE EXHIBITION. SEATED ON THE DAIS TOWARDS THE RIGHT IS THE PREMIER (HON. W. FORGAN SMITH).

Plate 137.

THE GRAND STOCK PARADE AT THE 1939 BRISBANE EXHIBITION.—The high standards attained by Queensland stock breeders was demonstrated admirably in the arena.

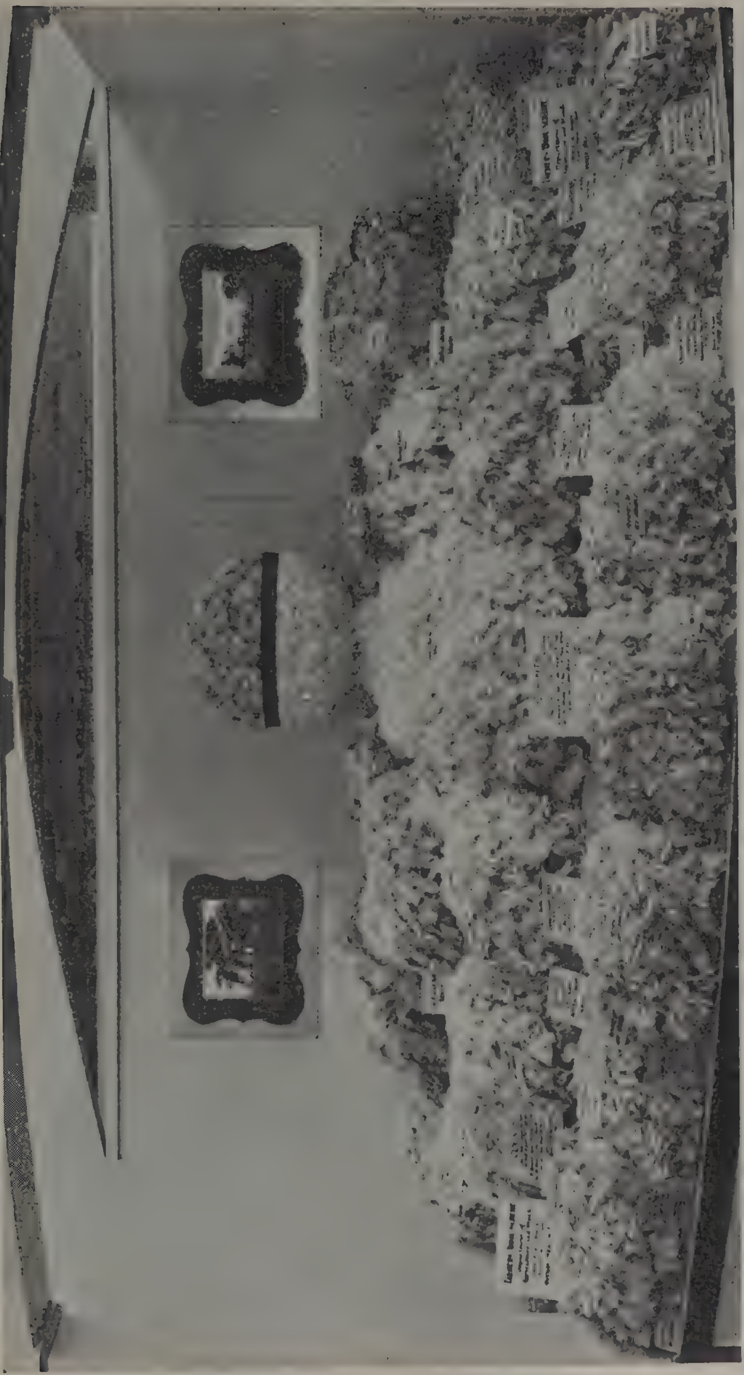


Plate 138.

WOOL IN CRIMPY STAPLE WITH THE YELLOW OF THE "YOLK" GLISTENING ON ITS FIBRES, TOPPED WITH SCOURED FLEECES READY FOR THE MANUFACTURER, WAS ELOQUENT TESTIMONY OF THE REMARKABLE RICHNESS OF QUEENSLAND'S PASTORAL COUNTRY.

Plate 139.

FROM BOLL TO BALE, LINT FOR AUSTRALIAN LOOMS.—In the Cotton Alcove, every phase of the industry and all its by-products were effectively represented.

Plate 140.

IN THE AGRICULTURAL COURT WERE DISPLAYED NATIVE AND INTRODUCED GRASSES, FROM WHICH IS DERIVED EIGHTY PER CENT OF QUEENSLAND'S ANNUAL INCOME.

Plate 141.

ORCHARD PRACTICE AND ITS PRODUCTS.—New cultural methods as well as every variety of fruit grown in Tropical and Sub-Tropical Queensland were represented in this impressive exhibit in the Court of Agriculture.

Plate 142.

THE WINNING "A" GRADE DISTRICT EXHIBIT.—This remarkable array of farm and factory products showed how closely the country and the town are linked in industry.

Plate 143.

A CEREAL STORY IN SHEAF AND GRAIN.—This array of Queensland wheats was the central theme of a display arranged by field officers of the Agricultural Branch. The work of the wheat breeder was represented strikingly in the numerous grain varieties which have been evolved to suit seasonal conditions in Queensland.

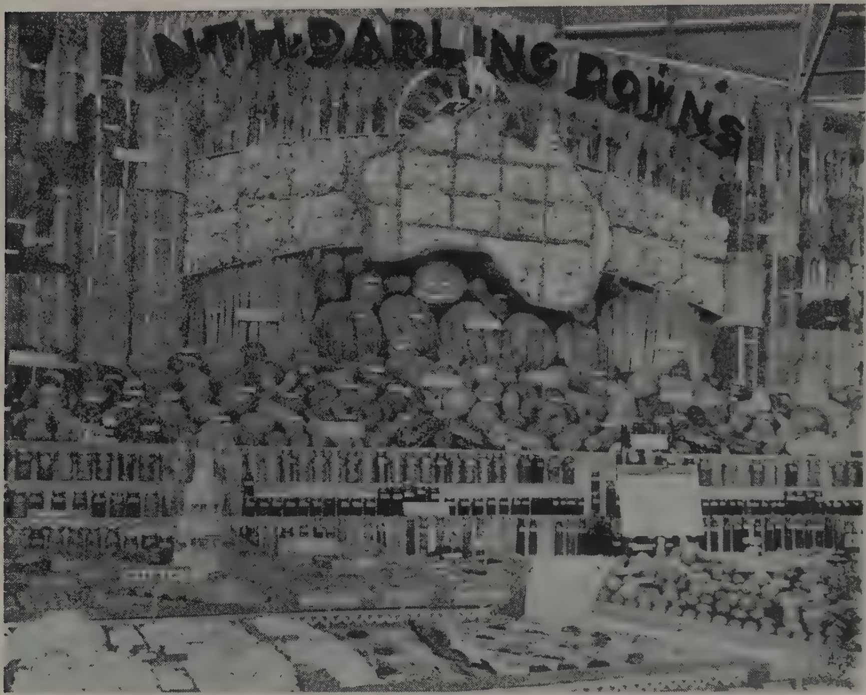


Plate 144.
THE PRODUCTIVITY OF THE DARLING DOWNS.

Plate 145.
FROM THE FRUITFUL COASTAL LANDS.—A section of the Woombye winning exhibit.

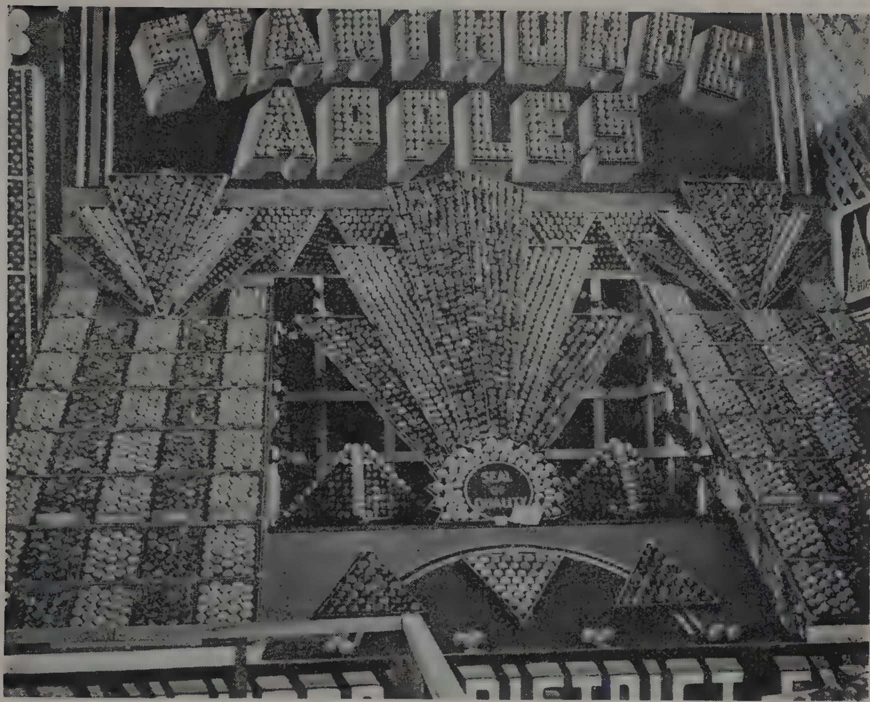


Plate 146.

From the Fruitful Granite.—The wealth and health of Stanthorpe apple lands arrayed arrestingly and in striking colour contrasts.

Plate 147.

A "Corner" in Agricultural Science.—Effective field work was the dominant note in this year's display of the Research Division.

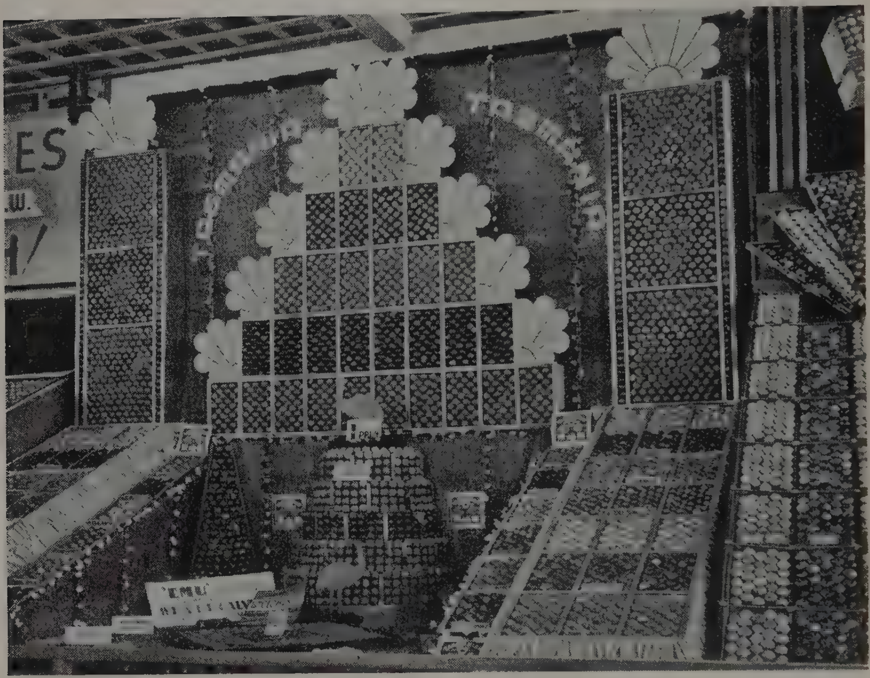


Plate 148.
A WINNING FRUIT EXHIBIT.—A luscious harvest from Tasmanian apple lands.

Plate 149.
THE EXHIBIT OF QUEENSLAND TOBACCO ATTRACTED THE KEEN INTEREST OF VISITORS TO THE COURT OF AGRICULTURE.

Plate 150.

FODDER CONSERVATION.—This fine display, arranged by the Agricultural Branch, was a feature of the Departmental Court. Scale models of silos—tower, pit, trench, and stack—and samples of silage formed the chief themes of an excellent educational exhibit.

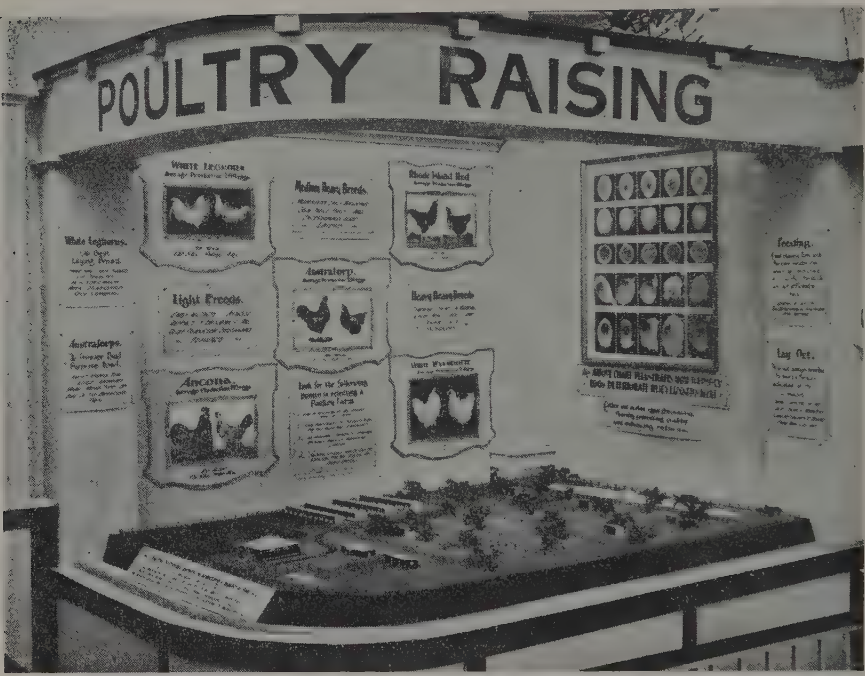


Plate 151.

THIS DISPLAY, WITH A MODEL POULTRY FARM AS ITS CENTRAL FEATURE, WAS A CENTRE OF INTEREST IN THE COURT OF THE DEPARTMENT OF AGRICULTURE.

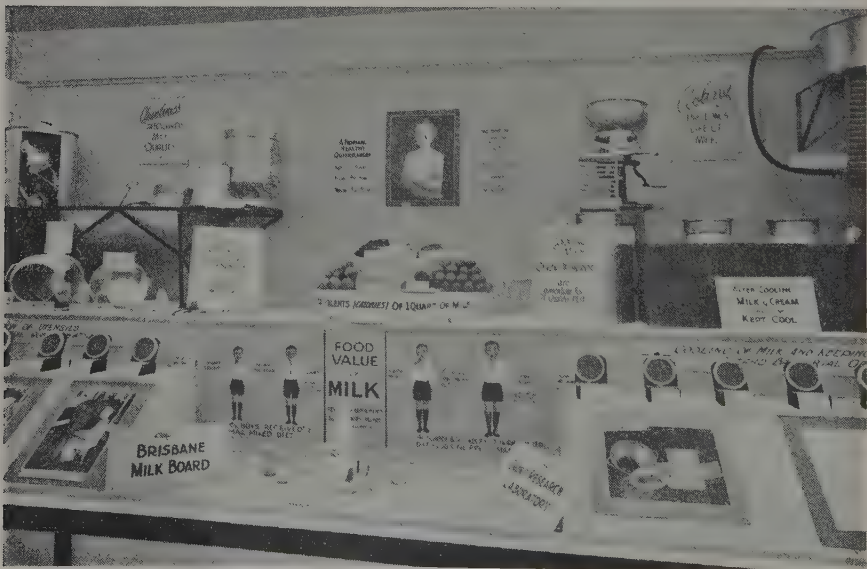


Plate 152.

LESSONS IN DAIRY MANAGEMENT.—This educative exhibit arranged by Departmental dairy research workers attracted great public interest at the Show.

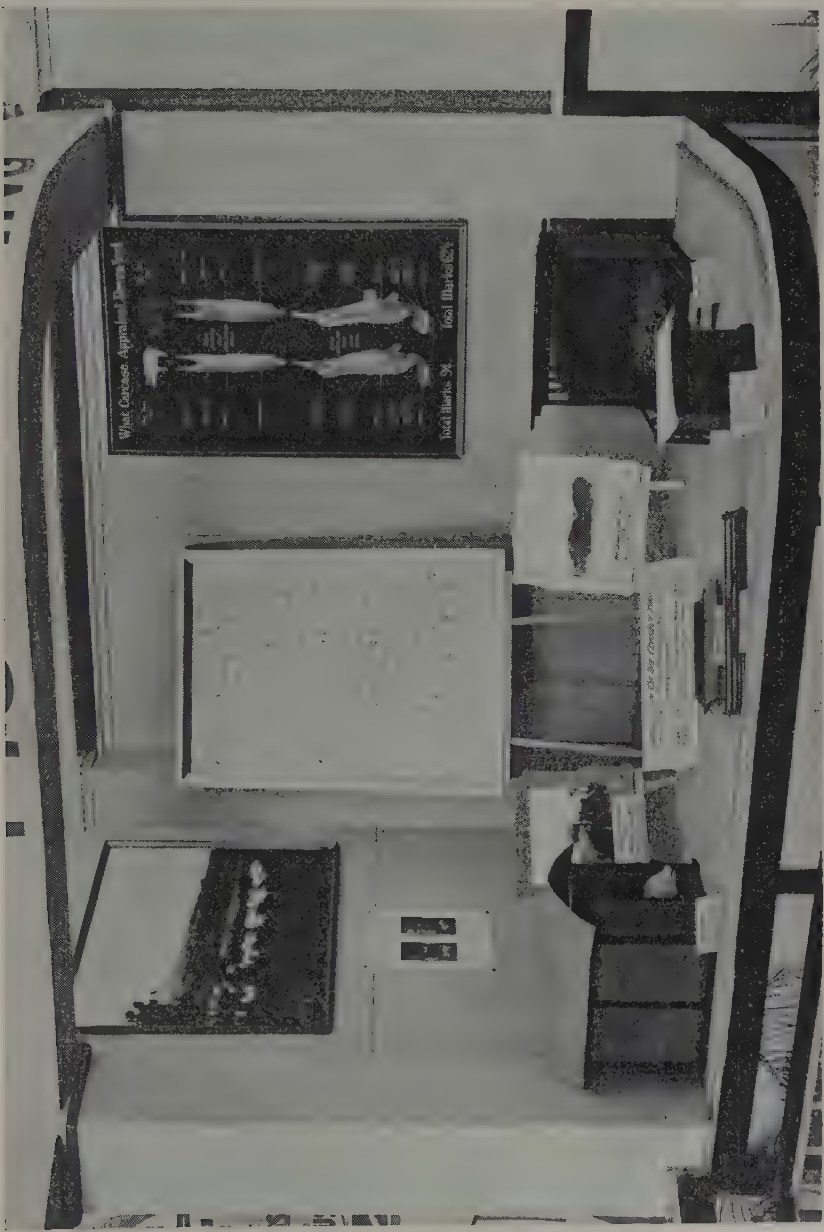


Plate 153.

POINTERS TO PROSPERITY IN THE PIG INDUSTRY WAS A CORNER FEATURE IN THE DEPARTMENTAL COURT.

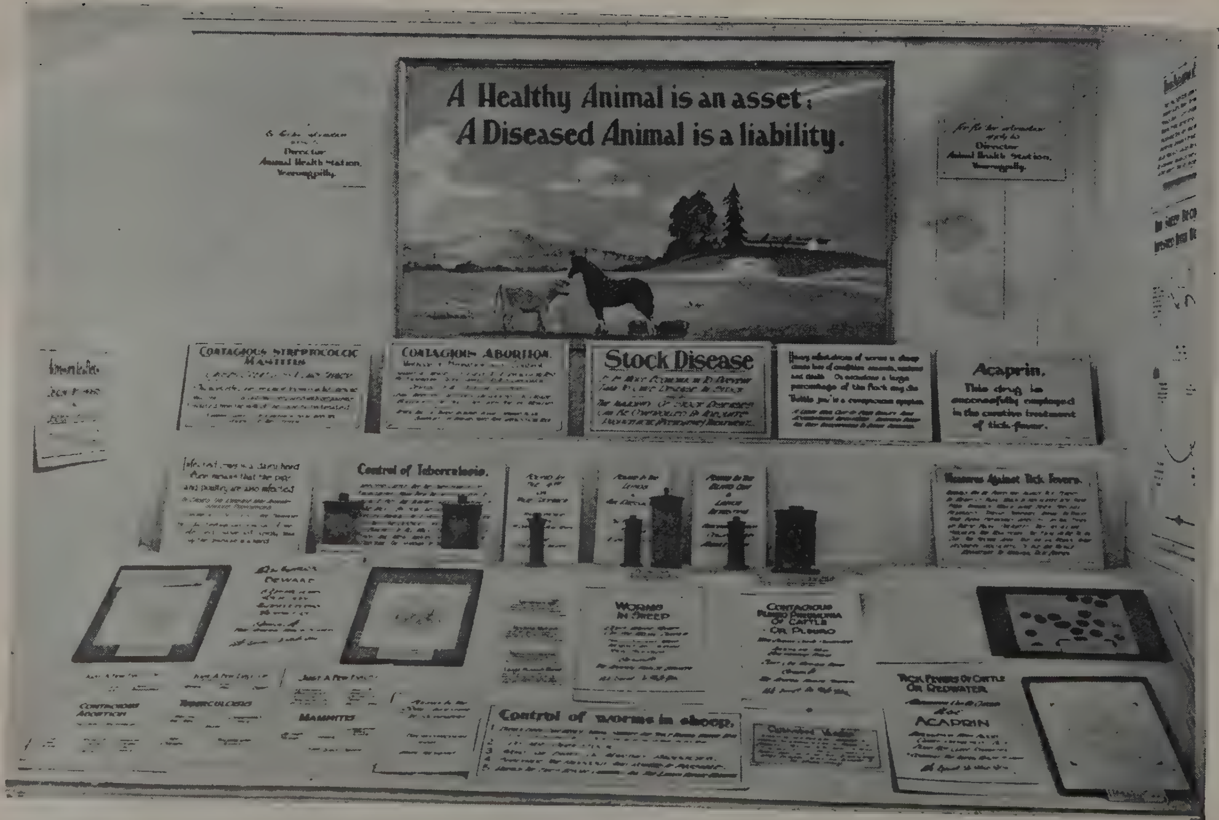


Plate 154.

DEPARTMENTAL WORK IN STOCK DISEASE CONTROL WAS WELL ILLUSTRATED IN THIS ALCOVE IN THE DEPARTMENTAL COURT.

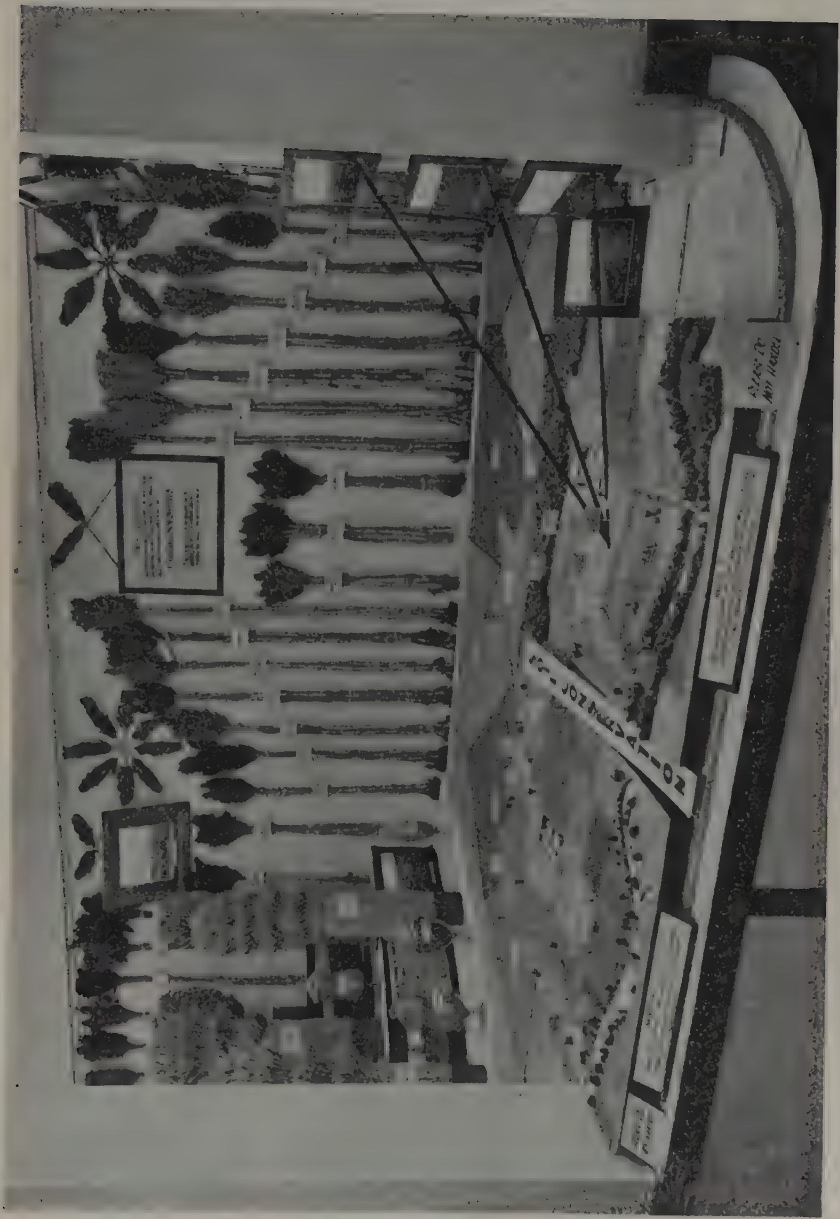


Plate 155.
A Panel in the Court of Agriculture.

Plate 156.

How Soil is Lost.—This scale model in the display of the Agricultural Branch illustrated how easily and rapidly erosion reduces farm fertility.

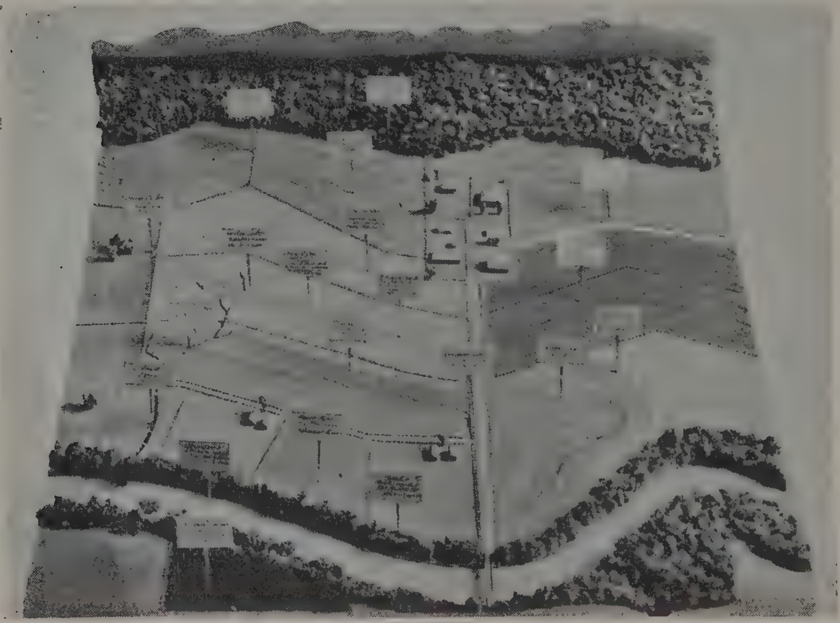


Plate 157.

How Soil is Saved.—Another model of the same farm was an object lesson on the importance of conserving the top layer of the earth's surface, and showed how it may be done by strip cropping and improved methods of cultivation.

Plate 158.

The Journal Alcove in the Court of Agriculture.—A "clearing house" for information on Departmental activities and services. Messrs. Jim Marley (right) and Laurie Muller were the officers in charge. Officers from every branch of the Department of Agriculture and Stock were in daily attendance in the Court to explain exhibits to Show visitors.

Plate 159.

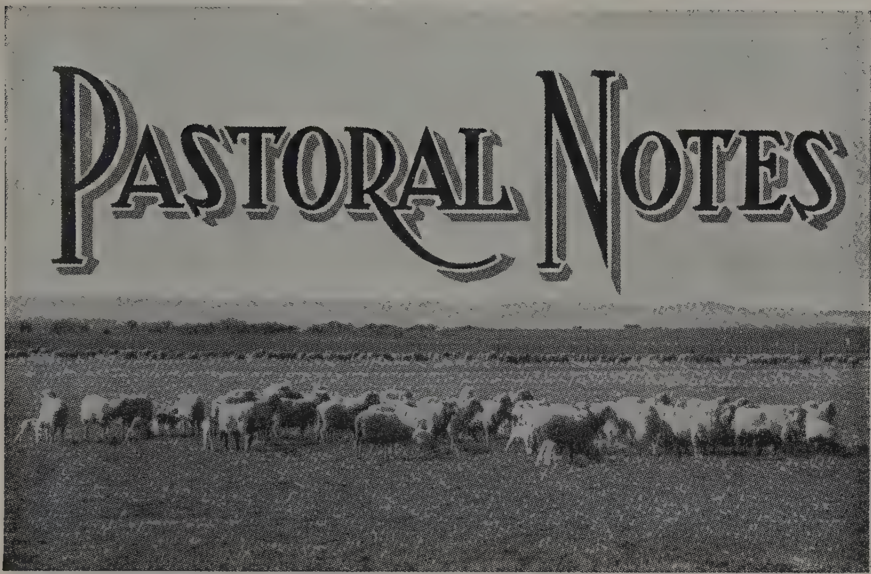
THE CHAMPION POLLED HEREFORD.—Miss Mary Dixon leading Mr. J. Sparkes's Park Prime Anxiety IV. from the judgment arena.

USE DEPARTMENTAL SERVICES.

When they have trouble with their cows—such as failure to breed, vaginitis, abortion, mammitis—many farmers say nothing about it. Others ask their neighbours, and generally end up by doing nothing, or else buy expensive remedies. When the disease has become serious and the financial loss heavy, some then decide to seek the advice of the dairy inspector or the Government veterinary surgeon; and when the officer arrives at the farm he is expected to perform a miracle and remedy the trouble immediately.

Officers of the Department are in the district for the farmers' benefit, and farmers are advised to communicate with them at the first sign of trouble.

Contagious abortion and mammitis are notifiable diseases under "*The Dairy Produce Acts,* 1920 *to* 1935."



Lung Worms in Cattle and Sheep.

Lung worms in cattle and sheep may become serious during late winter and spring. As a rule only the young animals are affected, and lung worms should be suspected in any animal showing loss of condition, accompanied by spasms of coughing, signs of suffocation, and scouring. Such symptoms may also be shown by animals which are suffering from a disease of the lungs brought about by some cause other than lung worms. In calves, for example, there is a type of pneumonia caused by bacteria, in which the symptoms are very similar to those associated with lung worm infestation. As the pneumonia due to lung worm infestation and that caused by the bacteria require entirely different treatments, it is always wise to kill an animal in which the disease is far advanced, and examine the lungs. If lung worms are present they will be seen readily, as they occur in bunches in the air tubes of the lungs surrounded by a blood-stained froth.

If the diagnosis is confirmed, the remainder of the animals affected with lung worms should be removed immediately to warm dry quarters, and drenched in order to remove other species of worms which might be present in the stomach. This procedure, whilst it does not affect the lung worms directly, increases the animal's resistance to them. Infested animals should be given plenty of nourishing food to build up the animal's strength.

In very severe cases, an injection of certain drugs can be made through the windpipe to expel the worms. This operation is not without risk, and in cases where an injection is desirable the assistance of the local stock inspector should be sought.

Further details regarding the drugs to be used for drenching and for injection into the windpipe may be had on application to the Animal Health Station, Yeerongpilly.

MANAGEMENT OF WINTER PASTURES.

The choice of a pasture mixture for winter grazing has to be based on a number of factors, including the average winter rainfall of the district, the chemical and physical characters of the soil, the cultivation treatment the land has received, the length of time the pasture is expected to remain, and the aggressiveness of weeds. Once a suitable mixture has been established it must not be considered "fool-proof," but should be managed with due regard to the pasture itself.

The temptation to over-stock paddocks during winter when the "broad acres" are unproductive must be resisted. Such pastures should as far as possible be reserved for cows in milk, for breeding ewes, or for fattening stock. The pasture should not be stocked too early in the growing season, but should be allowed to make good growth before grazing. When a paddock is ready for grazing, the animals should be permitted to graze on it for about an hour each day and they should be removed sooner if they begin to lie down. Camping on the area should be prevented, as the pasture becomes fouled and distasteful to the stock. Sufficient stock should be put on to eat a paddock down within ten days or so, but the pasture must not be too closely grazed. "Flogging" a pasture of winter grasses and clovers will certainly be harmful. After the completion of a grazing, the harrows or wooden drag should be run over the paddock to scatter the droppings. The pasture must be given ample time to recover and produce good growth before being grazed again. Sufficient paddocks of winter pasture should be provided to permit rotational grazing and to supply green, nutritious feed continuously throughout the cooler months of the year.

Certain of the annual winter pasture plants—e.g., Italian ryegrass, Wimmera ryegrass, and prairie grass—are self-seeding, and towards the end of the growing season pastures of these grasses must be left unstocked in order to permit the seed to ripen and shed. Areas which have been so treated should be lightly harrowed in early autumn to make a seedbed for the establishment of seedlings produced by the self-sown seed.

TWO WEEDS POISONOUS TO STOCK.

On the Darling Downs, in the Maranoa district, and in some other parts of Queensland, a very common weed may be seen in cultivation and along watercourses. It is upright in growth, about 3 feet high, with white flowers followed by a spiny seed pod, splitting at the top into four parts, and containing a large number of blackish seeds. In the districts mentioned, it generally goes under the name of castor oil, and the question is often asked if it is the true castor oil of commerce.

The fact is that the true castor oil is a different plant. The seed pods are superficially alike, but the plant is very much larger. Instead of being a small weed of cultivation, it is a shrub, or even a small tree, up to 10 feet high. It is very common around vacant allotments in coastal towns, and along creek and river banks in the near coastal districts. The seeds of the true castor oil are also poisonous, and have sometimes been eaten in the mistake that they would have the same

effect as a dose of castor oil. People who have accidentally or intentionally eaten the seeds have become violently ill, and it is said that in some cases even death has ensued. When the oil is expressed from castor oil seeds, the residue contains a poisonous principle, and this precludes the use of castor oil cake as a stock food.

The other plant is stramonium or thorn apple, and all parts of this plant are poisonous. It possesses a nauseating odour and flavour, and, because of this, the standing plant is rarely eaten by stock. On several occasions, however, the seeds and parts of the dried plant have been found as an impurity in chaff, and have caused the deaths of working horses and town cows. The seeds of this plant are the most poisonous part, and poultry should not be allowed to run where the plant is growing.

POLLED CATTLE AND THE CHILLED BEEF TRADE.

The need for hornless stock in the chilled beef trade has been stressed repeatedly by every section of the beef cattle industry.

In any programme of breeding or of grading up existing herds, the introduction of polled stock must be regarded as a necessity. Shorthorns and Herefords represent the bulk of the beef cattle in Queensland. Increased numbers of polled bulls of both these breeds are being imported. The polled Shorthorns and Herefords are a comparatively recent development, and the percentage of polled stock which will result from crossing with horned breeds is uncertain.

With the so-called "natural polls," the power to transmit this characteristic is marked. It is most noticeable in the Galloway breed, but this type is not well represented in Australia.

Red polled bulls crossed with horned breeds or their crosses may produce a large percentage of hornless stock, but the prepotency of Aberdeen Angus bulls with respect to colour, conformation, and hornlessness is superior. From 80 to 90 per cent. of the calves obtained when Aberdeen Angus bulls are mated with horned stock of mixed breeding are black in colour and most of them are hornless.

FOOD REQUIREMENTS IN A MAINTENANCE RATION.

All livestock rations are divisible into two parts—the part used for maintaining the body in a healthy condition, and the part used for production, whether it be for hair, wool, fat, meat, milk, or progeny. Under severe winter or drought conditions, the livestock owner is more concerned with a maintenance standard of feeding, and it becomes important to know where economies may most effectively be introduced.

A short consideration of an animal's reactions to starvation will supply the answer. Take the dairy cow in full lactation: the first defence which nature attempts is a conservation of material and the milk yield falls rapidly. Supplies to the body covering are restricted, and a dull, shaggy, lustreless coat develops. The body reserves of fat

are called on and the animal becomes thinner. Horns and hooves become brittle. As starvation advances, some encroachment is made on the last defences—the muscles and vital organs. At this stage, the animal weakens rapidly and collapse followed by death results. It is, therefore, clear that the last defences of the body—i.e., the muscles and vital organs—must be protected. For this purpose, the animal must be supplied with protein. In other words, drought feeding should centre round protein-rich foods. Where the stock are close to the source of such foods, the relative merits of each should determine which is to be fed, but on distant properties where freight charges are high it becomes important to buy the most concentrated and most digestible preparations.

Producers often remark that nature gave the sheep a commodius intestinal tract which must be filled, and they usually buy roughage of only moderate protein content. The argument is fallacious when the question is one of maintenance for limited periods only. It is surprising how well sheep can keep their condition on as little as two ounces of cotton seed meal and four ounces of maize daily.

The mineral requirements of stock should be provided for, but the excessive quantity of salt in many licks is unnecessary. Animals are capable of retaining enough salt for normal body functions from a very restricted intake, but lime and phosphate are continuously excreted and must be supplied in greater quantities. More than 30 per cent. of salt in a lick is rarely necessary, and in most cases it could well be less. Lime and phosphate are supplied in a number of forms, but on current prices well prepared sterilized bone meal containing about 20 per cent. protein is, apparently, the best.

SHEEP LAND FOR SELECTION AT CHARLEVILLE.

A resumption from Bulgroo and Kaffir Holdings has been surveyed as portion 1, parish of Bulgroo, and will be opened for Grazing Homestead Selection at the Land Office, Charleville, on Friday, 13th October, 1939. The portion, which has an area of 47,015 acres, is situated about 48 miles north-westerly from Quilpie.

The term of lease will be 28 years at an annual rental of $\frac{7}{8}$d. per acre for the first period of seven years.

A condition will be that the selection must be stocked to its reasonable carrying capacity with the applicant's own sheep within the first three years.

The portion is described as good, sweet, fattening and breeding country, nicely shaded with gidya and boree, fairly well grassed with Mitchell, Flinders, button, blue, mulga, and other good grasses and herbages. It is watered by three earth tanks.

Free lithographs and full particulars may be obtained from the Lands Department, Brisbane, the Land Agent at Charleville, and the Queensland Government Tourist Bureaux at Sydney and Melbourne.

OMMISSION.

In the August issue of the "Queensland Agricultural Journal" the following should be added to Plate 85, page 182; Plate 86, page 183; Plate 89, page 188; and Plate 90, page 189:—"(Magnification x 1200.)"

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Adler, Tinana	Nevertire	White Leghorns, Australorps, Rhode Island Reds, and Langshans
F. J. Akers, Eight Mile Plains	Elmsdale	White Leghorns and Australorps
E. J. Blake, Rosewood	Sunnyville	White Leghorns, Australorps, White Wyandottes and Rhode Island Reds
R. H. & W. J. Bowles, North Rockhampton	Glenmore Poultry Farm and Hatchery	White Leghorns and Australorps
J. Cameron, Oxley Central	Cameron's	Australorps and White Leghorns
M. H. Campbell, Albany Creek, Aspley	Mahaca Poultry Farm and Hatchery	White Leghorns and Australorps
J. L. Carrick & Son, Manly road, Tingalpa	Craigard	White Leghorns
N. Cooper, Zillmere road, Zillmere	Graceville	White Leghorns
R. B. Corbett, Woombye	Labrena	White Leghorns and Australorps
T. G. Crawford, Stratford	Rho-Isled	Rhode Island Reds
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme	White Leghorns, Australorps, and Rhode Island Reds
Dixon Bros., Wondecla	Dixon Bros.	White Leghorns
Rev. E. Eckert, Head street, Laidley	Laidley	Australorps, White Leghorns, and Langshans
Elks & Sudlow, Beerwah	Woodlands	Australorps and White Leghorns
W. H. Gibson, Manly road, Tingalpa	Gibson's	White Leghorns and Australorps
Gisler Bros., Wynnum	Gisler Bros.	White Leghorns
G. Grice, Loch Lomond	Kiama	White Leghorns
J. W. Grice, Loch Lomond	Quarrington	White Leghorns
Mrs. M. Grillmeier, Mount View, Milman	Mountain View	Australorps, Minorcas, and Rhode Island Reds
C. & C. E. Gustafson, Tannymorel	Bellevue	Australorps, White Leghorns, and Rhode Island Reds
P. Haseman, Stanley terrace, Taringa	Black and White	Australorps and White Leghorns
C. Hodges, Kuraby	Kuraby	Anconas and White Leghorns
J McCulloch, Whites road, Manly	Hindes Stud Poultry Farm	White Leghorns, Australorps, and Brown Leghorns

Name and Address.	Name of Hatchery.	Breeds Kept.
A. Malvine, junr., The Gap, Ashgrove	Alva ..	White Leghorns and Australorps
H. L. Marshall, Kenmore ..	Stonehenge ..	White Leghorns and Australorps
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White Leghorns, and Langshans
J. A. Miller, Racecourse road, Charters Towers	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	Australorps, Brown Leghorns, and White Leghorns
Mrs. H. I. Mottram, Ibis avenue, Deagon	Kenwood Electric Hatcheries	White Leghorns
J. W. Moule, Kureen	Kureen ..	White Leghorns and Australorps
D. J. Murphy, Marmor ..	Ferndale ..	White Leghorns, Brown Leghorns, Australorps, Silver Campines, and Light Sussex
S. V. Norup, Beaudesert Road, Cooper's Plains	Norup's ..	White Leghorns and Australorps
H. W. & C. E. E. Olsen, Marmor	Squaredeal Poultry Farm	White Leghorns, Australorps, Black Leghorns, Brown Leghorns, and Anconas
A. C. Pearce, Marlborough ..	Marlborough Stud Poultry Farm	Australorps, Rhode Island Reds, Light Sussex, White Wyandottes, Langshans, Khaki Campbell and Indian Runner Ducks, and Bronze Turkeys
E. K. Pennefather, Oxley Central	..	Australorps and White Leghorns
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farm	White Leghorns, Australorps, Langshans, Rhode Island Reds, and Brown Leghorns
G. R. Rawson, Mains Road, Sunnybank	Rawson's ..	Australorps
J. Richards, Atherton	Mount View Poultry Farm	White Leghorns and Australorps
H. K. Roach, Wyandra	Lum Burra ..	White Leghorns and Australorps
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
A. Smith, Beerwah	Endcliffe ..	White Leghorns and Australorps
A. T. Smith, The Gap, Ashgrove	Smith's ..	White Leghorns and Australorps
T. Smith, Isis Junction	Fairview ..	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
A. J. Teitzel, West street, Aitkenville, Townsville	Teitzel's ..	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's Poultry Farm	White Leghorns and Australorps
W. A. Watson, Box 365, P.O., Cairns	Hillview ..	White Leghorns
G. A. C. Weaver, Herberton road, Atherton	Weaver's Stud Poultry Farm	Wyandottes, Indian Game, Barred Rocks, Australorps, White Leghorns, Anconas, Rhode Island Reds, Buff Orpingtons, Black Orpingtons, and Buff Leghorns.
T. Westerman, Handford road, Zillmere	Zillmere ..	Australorps and White Leghorns
H. M. Witty, Kuraby	..	White Leghorns and Australorps
P. A. Wright, Laidley ..	Chillowdeane ..	Brown Leghorns, White Leghorns and Australorps
R. H. Young, Box 18, P.O., Babinda	Reg. Young's ..	White Leghorns, Brown Leghorns and Australorps

INCUBATION HYGIENE.

It has been proved conclusively that some poultry diseases are transmitted within the incubators. Having this knowledge, it is recommended that every incubator operator should do all in his power to minimise the possibility of the spread of disease.

There is little or no difference in the hatching results of dirty and clean eggs, but the filth on eggs may act as a vehicle in carrying disease, whereas clean eggs minimise such possibilities. Therefore, the first thing to do in incubation hygiene is to clean all eggs before placing them in the incubator.

After the chickens have been taken from the incubator the trays should be scrubbed, using disinfectant in the water, and the interior of the machine washed out with a similar disinfectant solution.

The fumigation of the incubator after washing is another precautionary measure which will considerably minimise the possibility of disease being transmitted within the machine.

Fumigation is a very simple process, and the method recommended is both cheap and efficient. Formalin (40 per cent.) and permenganate of potash are used, the quantities varying in accordance with the cubic capacity of the incubator. The following quantities are recommended: Formalin two teaspoonfuls, permanganate of potash one teaspoonful (scraped level with the edge of a knife), to each 20 cubic feet. Put the container in which the permanganate of potash has been placed in the incubator and pour on the formalin, closing the doors immediately. The doors should be kept closed for at least ten minutes.

REARING OF CHICKENS.

The successful rearing of chickens is one of the most important points in poultry-farming. Any setback which chickens receive, especially during the brooding stage, will be reflected in their development. Too much trouble cannot be taken to ensure that the chickens are reared under the most satisfactory conditions that circumstances will permit.

A reliable brooder is one of the first considerations—one that will generate sufficient warmth in the coldest weather to prevent the chickens packing together to get warm; and, at the same time, provide for plenty of fresh air. The brooder should be so constructed that the chickens can move away from the heat if the temperature is too high, and get back again without any obstruction. Much of the wastage of chicken life could be avoided if due regard were paid to these fundamental factors in brooding.

Suitable Cotton Varieties for the 1939-40 Season.

THE rapid expansion of the Australian cotton textile industry along certain lines of manufacture makes the growing of suitable varieties of cotton to supply the requirements of the spinners of the utmost importance to the cotton-growing industry in Queensland. The following recommendations of varieties capable of producing the required types of cotton are, therefore, made to assist farmers to choose the most dependable variety for their particular soil types and districts.

The most suitable variety for producing the $\frac{7}{8}$ to $\frac{15}{16}$ inch cottons on the alluvial soils of medium to good fertility in the southern district and in the South and Upper Burnett districts appears to be the Half and Half variety, which has yielded particularly well in these districts over a number of years. Some success has also been experienced with this variety in the Callide Valley, on the best of the fertile alluvials under good seasonal conditions, and also in the coastal areas. Half and Half reacts to droughty conditions, however, and should therefore never be planted on infertile soils or soils of low moisture-holding capacity. This variety produces medium-sized bolls, is generally a heavy yielder, is moderately early in maturity, picks well when grown under favourable conditions, and has the highest lint percentage of any cotton grown in Queensland.

Another most promising variety of the shorter-stapled cottons is New Boykin, which over a number of years has produced good yields of very uniform fibre. It appears to be more drought-resistant than Half and Half, and for that reason has a much wider range of adaptability, having been grown on the alluvial soils in all the main cotton-growing areas.

Several other medium-bolled, short-stapled cottons are also being investigated, but these cannot be released for commercial plantings until more information is collected regarding their behaviour on the various soil types of the different cotton-growing districts.

The requirements of the Australian spinning and manufacturing industries, in addition to $\frac{7}{8}$-inch cotton, at the present time demand a large proportion of $\frac{15}{16}$-in. to 1-inch, with considerable $1\frac{1}{16}$-inch staple cotton, and it is obviously necessary that a considerable acreage be planted annually to varieties capable of producing these staple lengths. The varieties producing these requirements fall into the class of cottons known as the hard-bodied, big-bolled types, which are grown mostly on the forest slopes and on the scrub areas, particularly those soils originally under brigalow and brigalow-belah scrub.

The Lone Star variety appears to be very suitable for most of the clay loams of the lower slopes originally covered by ironbark and box trees of the forest series, and brigalow, brigalow-wilga, and brigalow-belah of the scrub series. For a long period this variety has yielded satisfactory returns on such soils in the Maranoa, the South, Central, and Upper Burnett. It is rather a vigorous grower on fertile, loamy soil and should therefore not be planted on alluvial loams in districts likely to experience heavy mid-seasonal rains. It produces large, well-opened bolls, chiefly 5-locked, that pick easily and contain good-charactered lint of from $\frac{15}{16}$ to $1\frac{1}{16}$-inch staple lengths, according to soil and climatic conditions. It yields around 35 per cent. lint for the bulk stocks and considerably higher in some of the newer developed strains. Lone Star is undoubtedly a variety well suited for many of the districts, and should be grown wherever possible, as the lint is in great demand by the spinners.

Another big-bolled variety that is fast becoming a close competitor to Lone Star in some districts and one which should be grown to the fullest extent where conditions are suitable is the Miller variety, which has given excellent results on the clay loam soils of the lower forest and scrub slopes, as well as on the alluvial clays of moderate fertility in the Wowan, Callide Valley, Upper and South Burnett, and southern areas. It is somewhat earlier fruiting than Lone Star, and can therefore be planted on more fertile soil, but requires more moisture than does the latter variety, thus making it a better cotton for the heavier soils of the slopes in the coastal areas. The variety has proved to be jassid-resistant to a much greater degree than most other varieties, and is therefore recommended for planting in areas where this insect causes damage, such as the scrub areas of the South Burnett, Upper Burnett, and the Callide Valley. In the lastmentioned area, it is recommended for all areas except the more fertile alluvials. The bolls are large, and are very easily picked particularly on cultivations following grassland. The fibre is the fullest-bodied of any of the varieties being grown, and averages an inch in staple length, with a lint percentage of around 34. As a rule, rather high grades of lint are obtained from Miller, for the fibres clean up particularly well in the ginning process.

It will also be necessary to produce a substantial amount of the $1\frac{1}{8}$-inch staple cotton, and farmers who have obtained satisfactory yields of high-grade cotton with the Indio Acala variety should continue to grow this variety, particularly if it can be planted following grassland. It is advised, however, that there is little demand for the softer or yellow spotted grades of these longer cottons, and where growers of Indio Acala have received much of these grades it is recommended that the Miller or New Boykin varieties be tried.

It is stressed, though, that there is a bigger factor of safety for obtaining satisfactory yields of cotton of good quality from all varieties during the first three or four seasons following the breaking-up of grassland. After that, the changes in the chemical and physical condition of the soil that occur with further cotton cultivation make it necessary that the varieties be very carefully selected to suit the soil and climatic conditions. It is highly desirable, therefore, to practise cotton-grassland rotation in order that the most suitable land for growing cotton will always be available.

It is strongly recommended, however, that the farmer should apply to the field officer of the cotton section of the Department of Agriculture and Stock stationed in his district for advice as to the best variety for his conditions. Where there is no officer stationed, application should be made direct to the Department of Agriculture and Stock, Brisbane, for a large amount of evidence has been collected from experiments over a series of seasons as to the merits of the different varieties, which would be of assistance in determining the best variety, if the soil type and the age of cultivation are described by the inquirer.

CANE DISEASE INFESTED AREAS.

The amending clauses of "*The Sugar Experiment Stations Acts*, 1900 *to* 1938," provide for the declaration of cane disease infested areas, and the subsequent creation of Cane Disease Control Boards, on lines similar to those which have obtained for many years in respect of cane pest infested areas and Cane Pests Boards.

In view of the serious potentialities of gumming disease in the Mulgrave district, downy mildew at Mackay, and Fiji and downy mildew diseases in Southern Queensland, the following areas have been declared to be cane disease infested:—

1. Mulgrave (comprising the Mulgrave Mill area).
2. Mackay (comprising the Farleigh, Racecourse, Pleystowe, Marian, Cattle Creek, and North Eton Mill areas).
3. Bundaberg (comprising the Bingera, Fairymead—excepting that portion lying within the Parish of Gregory—Gin Gin, Millaquin, and Qunaba Mill areas).
4. Isis (comprising that portion of the Isis Mill area lying within the Parishes of Childers, Gregory, and Booyal).
5. Maryborough (comprising the Bauple and Maryborough Mill areas and that portion of the Isis Mill area lying within the Parishes of Vernon and Urangan).
6. Moreton (comprising that portion of the Moreton Mill area lying north of the Brisbane River).

Steps have now been taken to constitute Disease Control Boards for the above areas, and it is anticipated that the operation of these Boards will bring about a distinct improvement in the disease situation.

—*A.F.B., in "The Cane Growers' Quarterly Bulletin."*

Cultivating New Banana Land.

THE benefit to be derived from a thorough breaking up of the soil in new land should not be overlooked, especially as so much forest country is now being used for banana growing. If possible, breaking-up should be done before planting, but, with new land, time may not permit of this being done between burning-off and planting. Therefore, growers are advised to do this work during the first winter at the very latest, otherwise much damage may be done to the rooting system of the banana plants. Mattocks or fork hoes are the implements best suited for this work.

The land should be dug up to a depth of not less than 8 inches. A great improvement in the physical and mechanical condition of the soil will be observed soon afterwards. Increased root development, making possible the drawing of plant food from a much greater area, will result in vigorous plant growth and the production of larger bunches and fruit of higher grade.

On many farms, small crops, such as peas and beans, are planted between the rows of young bananas, and the thorough breaking-up of the soil will also benefit these crops, inducing quicker growth and greater bearing capacity.

The need of improving the humus content of the soil, particularly our forest soils, should be recognised. Humus can be added to the soil by burying the pea and bean plants after the pods have been picked. Shallow trenches should be dug across the slope of the land at convenient intervals, and the crop residues buried in the trenches under a covering of at least 2 inches of soil. The formation of these trenches across the slopes assists in preventing surface soil erosion.

Legumes such as beans and peas extract nitrogen from the air, and some of this nitrogen is returned to the soil in a readily available form when the roots and vines of these plants are turned under. The soil is thus enriched with this valuable plant-food. In addition, the humus

content, fertility, and moisture-retaining capacity—a very important factor in successful banana-growing—of the soil is increased, or at least, maintained.

Where the soil has been well dug, less chipping is required, because the rapid growth of the banana plant soon controls weed growth; besides, mechanical condition of the soil is improved, making chipping easier and thus reducing cultivation and production costs.

THE FARM TRUCK AND TRACTOR.

Running the tyres at an incorrect inflation pressure is the most common form of tyre misuse. Under-inflation causes excessive flexing of the outer cover, which results in the canvas walls cracking and ultimately collapsing. Excessive flexing of the tyre also distorts the tread, which abrades on the road surface.

A low-inflation pressure, on the other hand, allows the tyre to be trapped against the wheel rim, leading to concussion bursts. Excessively distorted twin tyres rub against one another.

The correct inflation pressure for the load carried should be found out from the vehicle or tyre manufacturer's representatives, every care being taken to maintain them and checking with an accurate gauge at frequent intervals. Tractor tyres are run at extremely low pressures to get a grip on soft or uneven ground, but such pressures should be used only when conditions demand them.

Tractor tyres last longer when run at maximum possible pressures, provided 30 lb. per square inch is not exceeded. Loss of pressure may be due to perished valve seatings or inner tubes; the former should be replaced at least once a year, and new inner tubes should always be fitted with new outer covers. Constant use of valve caps further ensures a safe air seal.

Over-inflation of tractor tyres causes rapid wear at the centre of the tread, and concussion bursts will be more likely as a result of higher strains thrown on the canvas of the outer cover when striking obstacles.

Road camber, too, tends to impose greater load on the inner tyre of a twin wheel, which should, therefore, be run at a pressure of 5 lb. per square inch below normal.

Regular removal of sharp objects from the tyres and stopping up the cuts with a special "tread-filling" compound do most to prevent rapid deterioration. When front, rear, and spare tyres are of the same size and type—but only then—even wear can be obtained by periodically exchanging their positions.

If tyres run out of true the tread will suffer seriously from abrasion. The sources of such trouble are loose wheels and bearings, and play in steering connections and swivel pins. Another cause is misalignment, which usually results from minor collisions and driving over kerbs, &c.

Damage is frequently caused by front tyres fouling chassis parts when the steering is locked hard over. The "toe in" of front tyres should be between nil and $\frac{1}{8}$ inch (this is obtained by adjusting the track rod). Rusty and distorted rim flanges damage the beading and break up the base of the tyre wall, while brake grab causes skidding and heavy tread wear.

Much as care in maintenance does to reduce tyre costs, this can be offset by careless driving. High road speed and violent acceleration and braking cause excessive tyre wear—especially on rough roads. Overloading has the same effects as under-inflation and a short period of excessive overloading.

Oil plays havoc with rubber, and a hot sun on a stationary tyre is equally bad. It is essential for all tyre repairs to be effected as soon as possible, for all types of damage rapidly become worse. This is especially so where cover lacerations expose the canvas to the weather.

The Fruit Market.

J. H. GREGORY, Instructor in Fruit Packing.

MARKET conditions have continued to be satisfactory with payable prices prevailing for all fruits. With warmer weather the demand for good quality fruit should be maintained, with prices on a satisfactory basis. Winter troubles such as black heart in pineapples and rubbery bananas should soon disappear.

The Brisbane Exhibition provided a great display of quality fruit, covering a wide range of variety. Tropical and temperate fruits were all shown in a display which, possibly, has never been bettered. Judging by the interest shown by visitors from New Zealand and Southern States it would be safe to assume that displays of this kind give far better advertising results than most other methods used. In the Court of the Department of Agriculture and Stock many interesting observations were made of the condition the different fruits maintained in their various containers. For the second year in succession strawberries kept better in boxes, no waste being apparent, while a high percentage of waste developed in the trays used for Southern export. This result was obtained from two different supplies of berries. The first picking was four days after heavy rain, while the second seven days after. The tomatoes displayed were also an object lesson to those growers who persist in picking green tomatoes to send to Southern markets. The fruit shown had been harvested on the Thursday before the Exhibition and all showed one quarter colour. When examined on the Monday after the Exhibition no waste was found. This was eleven days after harvesting, and the fruit was still in a saleable condition.

Considering the warm conditions prevailing during the display all fruits kept well, being a silent tribute to those who so carefully handled and prepared it for exhibition.

By making careful handling a habit, coupled with the observance of sensible maturity standards, the supply of quality fruit to the public can be considerably expanded.

Prices during the last week of August were:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Small, 10s. to 11s. 3d.; Sixes, 11s. to 13s.; Sevens, 13s. to 15s. 6d.; Eights and Nines, 14s. 6d. to 16s. 6d.

Sydney.—Cavendish: Sixes, 10s. to 14s. 6d.; Sevens, 14s. to 17s.; Eights and Nines, 17s. to 20s.

Melbourne.—Cavendish: Sixes, 12s. to 14s.; Sevens, 13s. to 16s.; Eights and Nines, 15s. to 18s.

Adelaide.—Cavendish: 18s. to 21s. per case.

Some lines on Southern markets showing squirter.

Lady's Finger, 2d. to 10d. per dozen. Inferior lower.

Pineapples.

Brisbane.—Smoothleaf: 4s. to 7s. case. Ripley, 4s. to 6s. case; 1s. to 3s. 6d. dozen.

Sydney.—Smoothleaf: 6s. to 10s. case.

Mebourne.—Smoothleaf: 7s. to 10s. case.

Adelaide.—Smoothleaf: 11s. to 15s. case.

Green fruit hard to place on Southern markets.

Papaws.

Brisbane.—Yarwun, 5s. to 7s. tropical case; Gunalda, 3s. to 4s. 6d. bushel; Locals, 1s. 6d. to 3s. bushel.

Sydney.—6s. to 14s. tropical case.

Melbourne.—8s. to 12s. tropical case.

Custard Apples.

Brisbane.—4s. 6d. case. The season for this fruit is now drawing to a close. Prices throughout the season have been satisfactory.

Monstera Deliciosa.

6s. per dozen.

Avocados.

Brisbane.—8s. to 12s. case.

Passion Fruit.

Brisbane.—Firsts, 8s. to 10s.; Second Grade, 5s. to 7s. 6d.

Sydney.—5s. to 9s. Special Grades higher.

CITRUS FRUITS.

Oranges.

Brisbane.—Valencias and Commons: Howard, 6s. to 9s. bushel: Locals, 5s. to 8s. 6d. bushel Southern Navels, 8s. to 11s. bushel.

Mandarins.

Brisbane.—Ellendale, 12s. to 16s. case; Emperor, 9s. to 12s. case; Glens, 12s. to 16s. case. Inferior lines lower.

Grape Fruit.

Brisbane.—6s. to 9s. bushel case.

Lemons.

Brisbane.—5s. to 9s. bushel case. Specials higher.

DECIDUOUS FRUITS.

Apples.

Brisbane.—Jonathan, 6s. to 13s.; Sturmer, 6s. to 8s.; Granny Smith, 8s. to 13s.; Democrat, 7s. to 10s.; Cleopatra, 8s. to 11s.; French Crab, 5s. to 8s.; Yates, 10s. to 13s.; Scarlets, 8s. to 10s.

Pears.

Brisbane.—Josephine, 8s. to 13s.; Parkham's Triumph, 6s. to 11s.; Winter Nelis, 9s. to 13s.; Winter Cole, 9s. to 15s.

Strawberries.

Brisbane.—4s. 6d. to 8s. box. Some Specials higher.

Sydney.—Trays, 2s. to 4s.; boxes, 6s. to 11s.

OTHER FRUITS.

Tomatoes.

Brisbane.—Ripe, 4s. to 8s.; coloured, 4s. to 9s.; green, 3s. to 7s.

Sydney.—Cleveland, 8s. to 16s.; Local hothouse to 19s.

Cape Gooseberries.

5d. to 6d. lb.

MISCELLANEOUS VEGETABLES, &c.

Cucumbers.—Melbourne: 14s. to 16s. case.

Pumpkins.—4s. 6d. to 5s. 6d. bag.

Marrows.— 1s. 6d. to 3s. 6d. dozen.

Lettuce.—6d. to 1s. 6d. dozen. The improvement in quality of lettuce packed in boxes is most noticeable.

Cabbages.—1s. 6d. to 5s. dozen.

Cauliflowers.—5s. to 9s. dozen; smaller lower. Stanthorpe, 8s. to 12s.

Beans.—Brisbane, 8s. to 12s. sugar bag; inferior lower. Melbourne, 6d. to 9d. lb. Sydney, 8s. to 11s. case.

Peas.—Brisbane, 7s. to 9s. case; inferior lower. Melbourne, 4d. to 7d. lb.

Beetroot.—3d. to 9d. dozen.

Chokos.—9d. to 1s. 6d. dozen.

Carrots.—3d. to 9d. bundle.

Celery.—Local, 9d. to 2s. bundle; South Australian, 15s. to 17s. crate.

Rhubarb.—9d. to 1s. 6d. bundle.

TOOL SHARPENING.

Few "amateurs" make a success of sharpening chisels and plane-cutters, yet the conditions for success are only a suitable stone and lubricant, and a correct grip on the tool. The latter can be acquired only by constant practice, after expert demonstration, but the problem can easily be avoided with the appliance shown.

The device is for use on a circular stone. Correct angle is obtained by varying the distance between cutting edge and roller.

This matter of bevel angle is of some importance. The more orthodox type has two bevels, one made by the grindstone, at an angle of 25 degrees, and a sharpening bevel of about 35 degrees. Irons of exceptionally tough steel, such as are used in

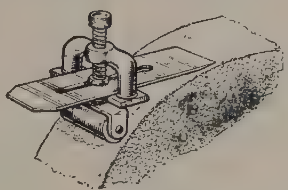


Plate 160.

all-metal planes, need less support at the edge, and are sharpened to a single bevel of 25 degrees. As a guide, this angle is often engraved on the cap iron.

Fine carborundum is a good general-purpose type of stone, and if found too fast-cutting, may be toned down by soaking in a tin of molten vaseline.

Use non-gumming oil, and wipe the stone clean after use. Neatsfoot is regarded as best, but many craftsmen use a highly refined lubricating oil. An uneven stone may be levelled by rubbing on a large flat stone with sand and water.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, Jersey Cattle Society, Friesian Cattle Society, and the Guernsey Cattle Society, production charts for which were compiled during the month of July, 1939. (273 days unless otherwise stated.)

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (STANDARD 350 LB.).			
Laguna Venus II.	F. G. Lamkin, Kaimkillenbun	11,478·78	463·461	Morden Marcus
	SENIOR, 4 YEARS (STANDARD 330 LB.).			
Rosemount Doreen 42nd.	Rex Tweed, Kandanga	8,746·2	369·597	Springdale Jupiter
	JUNIOR, 4 YEARS (STANDARD 310 LB.).			
Fairvale Ethel	J. H. Anderson, Fairvale, Southbrook	9,117·69	397·006	Blacklands Stately Major
	SENIOR, 3 YEARS (STANDARD 290 LB.).			
Palmeto Model	Rex Tweed, Kandanga	7,947·7	357·579	Glengallon Major
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Happy Valley Model's Empress	R. R. Radel, Happy Valley, Coalstoun Lakes	8,117·15	338·336	Burradale Emperor
Croydon Fedora	T. Knopke, Summer Holm, Laidley	7,774·48	302·703	Mount Blow, Mikado
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
Bri Bri Cherry 13th.	A. T. Paull, Bowenville	6,836·02	339·704	Bri Bri Royal Prince
Bri Bri Angeline 9th.	A. T. Paull, Bowenville	6,441·81	300·653	Radford Patrol
Alfa Vale Gwen 8th. (257 days)	F. G. Lamkin, Kaimkillenbun	7,729·91	290·852	Reward of Fairfield
Happy Valley Ailsa	R. R. Radel, Coalstoun Lakes	6,041·65	279·098	Sunnyview Artist
Bri Bri Sunray II.	A. T. Paull, Bowenville	5,762·33	265·83	Radford Patrol
Calrossie Model	D. L. Lithgow, Calrossie, Jandowae	6,550·45	260·884	Sunnyside Major

	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Star 5th of Alfa Vale	W. H. Thompson, Alfa Vale, Nanango	10,169·5	424·379	Reward of Fairfield
Glenroy Betty	W. F. Kajeswki, Glenroy, Glencoe	10,093·7	410·147	Parkview Glider
Glenroy Bluebell 2nd.	W. F. Kajewski, Glenroy, Glencoe	9,539·6	400·02	Blue Boy of Glenthorn
Glenroy Millie 2nd.	W. F. Kajewski, Glenroy, Glencoe	8,547·7	381·71	Blue Boy of Glenthorn
Daisy of Happy Valley	R. R. Radel, Happy Valley, Coalstoun Lakes	8,457·11	346·483	Molly's Hero of Glenthorn
Springleigh Primrose 5th.	H. F. Moller, Springleigh, Boonah	7,728·25	314·543	Burradale Ronald
Happy Valley Buddy	R. R. Radel, Happy Valley, Coalstoun Lakes	6,363·15	304·058	Sunnyview Artist
Calrossie Dolly	D. L. Lithgow, Calrossie, Jandowae	7,053·96	289·878	Sunnyside Major
Mountain Home Violet 2nd.	M. C. Lester, Laidley Creek West	7,505·12	236·423	Sunnyview Alert
	JERSEY.			
	MATURE COW (STANDARD 350 LB.).			
Retfords Bracken Snowdrop	W. S. Conochie, Sherwood	9,036·55	508·404	Retford Brown Victor
Brooklands Desert Majesty (223 days)	W. S. Conochie, Sherwood	9,262·65	440·315	His Majesty of Dalebank
Lyndhurst Peerless	W. Semgreen, "Tecoma", Coolabunia	6,912	436·921	Retford's Brunettes Noble
Westbrook Tulip 44th.	Farm Home for Boys, Westbrook	8,429	403·563	Westbrook Prince
Trecarne Rosella 4th.	T. A. Petherick, Lockyer	8,260	401·313	Trinity Officer
	JUNIOR, 4 YEARS (STANDARD 310 LB.).			
Brooklands Royal Rosina	W. S. Conochie, Sherwood	9,770·1	441·807	Retford Earl Victor
Oxford Remus Syria	R. J. Crawford, Inverlaw, Kingaroy	7,168·15	406·734	Overlook Nancy's Remus
	SENIOR, 3 YEARS (STANDARD 290 LB.).			
Hamilton Fancy	A. H. Steiler, Lanefield	6,765·25	345·755	Retford Mays Victor
Woodbine Bessie	J. Williams, Woodbine Stud, Wondai	6,786·5	326·955	Brooklands Royal Gift
Westbrook Tulip 67th.	Farm Home for Boys, Westbrook	6,959·45	293·085	Oxford Gem's Ambassador
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Lermont Golden Gem	J. Schull, Lermont, Oakey	6,230·35	294·379	Woodside Golden Volunteer
Westbrook Bells 3rd.	Farm Home for Boys, Westbrook	5,388·3	286·903	Oxford Golden Dreamer

Production Recording—*continued.*

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
Hamstead Olivette 3rd	J. H. C. Roberts. 230 Herries Street, Toowoomba	6627·4,	298·035	Kelvinside Ellerson
Hamilton Bangle	H. H. Steiler, Lanefield	5,558·65	295·916	Retford May's Victor
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Glenview Rayon	Geo. Harley, Childers	7,342·7	401·258	Trinity Governor's Hope
Inverlaw Golden Belle	R. J. Crawford, Inverlaw, Kingaroy	6,018·3	323·548	Oxford Royal Lad
Inverlaw Patsy	R. J. Crawford, Inverlaw, Kingaroy	5,973·72	322·253	Oxford Royal Lad
Westbrook Sultane 3rd	Farm Home for Boys, Westbrook	6,347	311·354	Oxford Gem's Ambassador
Glenmoore Silver Belle	L. J. Comiskey, Warra	5,620·4	290·659	Glenmoore Vile King
Oxford Snowflake 2nd	Farm Home for Boys, Westbrook	5,352·8	251·514	Oxford Peer
Ashview Grace	C. Huey, Ashview, Sabine	4,940·8	250·787	Martinville Duke
	FRIESIAN.			
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Cressbrook Chloe Regina 2nd	F. C. Noller, Kumbia	8,315·42	345·79	Burnbrae Rex
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
Cressbrook Glorie Star 2nd	F. C. Noller, Kumbia	8,695·14	332·005	Burnbrae Gulvallis Starlight
	GUERNSEY.			
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Laureldale Lola	W. A. Cooke, Laureldale, Witta	7,307·25	345·17	Linwood Favour
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
Laureldale Velvet	W. A. Cooke, Laureldale, Witta	5,805·1	252·046	Laureldale Ranie Prince
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Laureldale Calm	W. A. Cooke, Laureldale, Witta	5,935·35	272·348	Laureldale Resident

General Notes

Staff Changes and Appointments.

Miss E. M. O'Sullivan has been appointed assistant cane tester for the remainder of the sugar season at the Mulgrave mill.

Constable H. D. Vohland (Mount Molloy) has been appointed also an inspector under the Slaughtering Act.

The following members of the Noosa Shire Council has been appointed honorary protectors under "*The Fauna Protection Act of* 1937" in respect of the sanctuary for fauna recently declared in part of the Noosa Shire:—Messrs. W. I. Ferguson, (Cooroy), J. M. McKane (Cooran), W. B. Grady (Kin Kin), J. F. P. Walker (Kin Kin), A. E. W. Cooper (Pomona), D. H. Uhlmann (Pomona), J. J. Galloway (Pomona), W. Cambage (Cooroy), F. T. Bryan (Cooroy), R. J. McAnally (Cooroy), and R. T. Read (Tewantin).

Mr. A. T. Sewell (Emerald) has been appointed an honorary protector under the Fauna Protection Act in connection with the fauna sanctuary declared last week, and embracing portion of the Nogoa River, near Emerald.

Mr. J. D. Stevens (Albany Creek) and D. Herron (Dalrymple Heights, via Mackay) have been appointed honorary protectors under "*The Fauna Protection Act of* 1937" and honorary rangers under "*The Native Plants Protection Act of* 1930."

Constable A. A. Anderson (Nerang) and Constable G. Beikoff (Chillagoe) have been appointed also inspectors under the Slaughtering Act.

Constable A. D. McPhail (Mackinlay) has been appointed also an inspector under the Brands Acts.

Mr. J. J. Banks (Northam avenue, Bardon) has been appointed an honorary protector under the Fauna Protection Act.

Messrs. J. H. Schmitz (Wave Hill, Gin Gin) and H. J. Hampstead (Kilcoy) have been appointed honorary protectors under the Fauna Protection Act and honorary rangers under the Native Plants Protection Act.

Mr. A. J. McRobbie, South Johnstone, has been appointed millowners' representative on the South Johnstone local sugar cane prices board, vice Mr. F. Martinez, resigned.

Messrs. E. A. Davies, F. T. Adkins, H. J. House, F. Pragnell, K. Curtis, C. J. Payne, N. Stanley, L. Wehlisch, G. Stringfellow, G. Flesser, and J. Hempsall, of Canungra, have been appointed honorary protectors under "*The Fauna Protection Act of* 1937," and honorary rangers under "*The Native Plants Protection Act of* 1930."

Wild Life Preservation—A Proserpine Sanctuary.

An Order in Council has been issued under "*The Fauna Protection Act of* 1937," declaring Funnel Bay and Jubilee Pocket in the Proserpine District to be a sanctuary for the protection of fauna. Mr. J. E. Langford, of Proserpine, has been appointed an honorary protector for the sanctuary and also an honorary ranger under the Native Plants Protection Act.

An Order in Council has been issued under "*The Fauna Protection Act of* 1937" declaring the property of Mr. F. Hungerford, near Biloela, to be a sanctuary, and that Mr. Hungerford has been appointed an honorary protector for the sanctuary.

Canary Seed Hail Insurance.

A Regulation has been issued under the Primary Producers' Organisation and Marketing Acts, providing that the canary seed hail insurance regulations shall have no force or effect in respect of canary seed planted during the year 1939.

Isis Mill Quarantine Area.

A Proclamation has been issued under the Sugar Experiment Stations Acts declaring portion of the Isis mill area to be a quarantine area in respect of Fiji disease of sugar-cane. The nature of the quarantine to be imposed therein shall be the prohibition of the removal of sugar-cane of any variety (except for milling at Isis mill) from one plantation to another within the quarantine area unless permission in writing for such removal shall have first been granted by an inspector.

Fruit Marketing—Sectional Group Committees.

Certain regulations under the Fruit Marketing Organisation Acts have been re-issued, and provide that every qualified member of a local association within the electorate concerned shall be eligible to vote for the return of a member or members to the banana, pineapple, citrus, other fruits, and deciduous sectional group committees, and that where partners are owners, part owners, or tenants, those persons who are working partners shall be allowed to vote.

Hail Insurance.

The Barley Board hail insurance scheme regulations issued in 1930, and amended in 1934, have been further amended and added to. These amendments bring the Barley Board scheme into line with the State Wheat Board, and provide, briefly, that crops of barley, either fully or partially out in ear, shall be covered only during the period in each crop year commencing on the 16th August and continuing until the 31st January following. No compensation shall be payable in respect of hail-storm damage, unless a return in the prescribed form, or similar notification in writing, has been lodged with the board on or before the 30th September, 1939, in respect of the crop of that year, or before a date to be determined by the board from time to time, but not later than 15th September in any other year.

Notifications shall be made to the board within 48 hours after damage to barley by hail. The board shall appoint assessors for the purpose of assessing losses.

Compensation payable under the scheme shall be by advances determined by the board as being the value of the barley on the stalk at the time of harvesting, but compensation payable from the hail insurance compensation fund in the aggregate in any one year may not exceed 7½ per cent. of the total value of the barley insured in the same year, and shall be apportioned *pro rata* on the losses sustained.

Moreton-Mapleton Cane Quarantine Areas.

Two proclamations have been issued under "*The Sugar Experiment Stations Acts*, 1900 *to* 1938," declaring the Moreton mill district and an area embracing Mapleton to be quarantine areas under the Acts because of the presence of Fiji disease of sugar-cane. The nature of the quarantine shall be the prohibition of the removal of sugar-cane of any variety (except for milling at Moreton mill) from any plantation within such quarantine areas, and the prohibition of the planting or transplanting of sugar-cane of the variety P.O.J. 2878.

North Eton Mill Levy.

Regulations have been issued under the Primary Producers' Organisation and Marketing Acts empowering the North Eton Mill Suppliers' Committee to make a general levy for administrative purposes on growers of sugar-cane who are suppliers to the North Eton mill at the rate of ½d. per ton on cane delivered by each grower allocated to the No. 1 Pool. The committee is only desirous of collecting the levy on cane required to fill the mill's peak quota, and each grower will be given a proportion of his estimated deliverable cane for delivery into the Pool.

Canary Seed Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts extending the operations of the Canary Seed Board from 1st June, 1939, until 30th June, 1940.

Messrs. S. J. Gilmour (Cambooya), W. A. Ross (Macalister), and the Acting Director of Marketing have been appointed members of the Board until the 30th June, 1940.

Plywood and Veneer Board Levy.

The Plywood and Veneer Board levy, the proceeds from which are used to provide for the administrative expenses of the Board, has been extended for the period from 3rd May, 1939, to 2nd May, 1942. The levy is at the rate of 3d. per 100 feet face measurement on plywood three-sixteenths of an inch or less in thickness and on veneer three-sixteenths of an inch in thickness, and on plywood or veneer of a greater thickness than three-sixteenths of an inch and on veneer of a lesser thickness than three-sixteenths of an inch at the rate per 100 feet face measurement which bears the same proportion to 3d. as the thickness of the plywood or veneer bears to three-sixteenths of an inch.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of Mr. W. D. Francis, Botanist.

A Native Rosemary.

D.G.McA. (Clifton)—

The native rosemary (*Cassinia lævis*) is a shrub with very narrow, fine leaves, and a peculiar resinous smell. Its name is derived from this smell, which is somewhat like that of rosemary.

In the Inglewood district, several graziers have complained that their lambings have dropped, and they considered that native rosemary was the cause of the shrinkage. It appears that the lambs died a day or so after birth. Before these complaints from Inglewood, we had never heard of this plant being harmful to stock. It has been suggested that the oil which gives the plant its peculiar smell may be the cause of the trouble. In some of the Inglewood country, after ring-barking, the native rosemary, at times, overgrows a large part of the flat country. It eventually kills the grass out, and makes mustering of the sheep difficult.

We shall be glad to identify any samples of plants that you care to send along.

Broad-leaved Carpet Grass.

J.H. (Ormeau)—

The specimen is the broad-leaved carpet grass, *Axonopus compressus*. It is a native of North America. This grass is not such a menace to pastures as the narrow-leaved carpet grass (*Axonopus affinis*). Stock eat the broad-leaved kind much more readily than the other. The narrow-leaved species is often called mat grass, and is the species which is threatening paspalum pastures.

If your pastures consist principally of paspalum and water couch, it might be worth your while to eradicate the broad-leaved carpet grass before it gets a strong hold.

Plants from Ingham District Named.

E.L. (Project Club, State School, Long Pocket, via Ingham)—

Your specimens have been determined and are reported on as follows:—

11. Giant spear grass, *Heteropogon triticeus*. A tall, coarse, grass of very limited feed value.
12. Bunch spear grass, *Heteropogon contortus*. A coarse grass of very limited feed value, except when very young.
13. Giant Couch, *Brachiaria mutica*. An introduced grass, with a high reputation as fodder, especially in tropical localities. It is partial to damp situations, such as river flats.
14. *Ischæmum australe*. Generally considered to be a fairly good grass in poor, sandy, coastal soils.
15. Ditch millet, *paspalum orbiculare*. Nutritionally, an inferior grass.
16. Rice grass, *Leersia hexandra*. A fairly good grass.
17. *Paspalidium distans*. Mostly assumed to be a fairly nutritious grass, but is often sparsely distributed.
18. Crow's foot grass, *Eleusine indica*. Very common about yards where there is traffic. Often eaten by stock when there is a scarcity of other finer grasses.
19. Red Natal grass, *Rhynchelytrum repens*. Introduced here from South Africa. Stock are fond of it, but it is fairly easily pulled out by the roots by grazing stock .
20. River grass, *Chionachne cyathopoda*. Reputed to be a fairly good fattening grass, although rather coarse.

A Flinders Grass.

J.B. (Jimbour)—

The specimen is *Iseilema membranacea*, one of the Flinders grasses, of which there are about ten species. The Condamine-Surat district is on the eastern margin of Flinders grass country, and it becomes more prevalent and does better further west. It is not reputed to stand heavy stocking, and tends to be eaten out in that district. The seed germinates very rapidly after a little rain, and the grass reaches maturity sometimes within a couple of months. The seed heads are numerous and nutritious, being licked up from the ground by cattle in some districts. This accounts for its dying out, but where cracks occur in the soil much of it is then retained for the following year.

Rather conflicting reports have been received as to its palatability, but, on the whole, it generally seems to be eaten both green and dry in the drier districts. Where rain falls on the dried grass, however, it soon goes mouldy, and is generally left alone then, although we have heard of a case where horses were said to relish it in this condition.

It is doubtful whether the grass would be of much use as a winter one, although good stands of it have been seen in late autumn and early spring. Its occurrence seems to be mainly controlled by the time of rainfall.

Although it is regarded as a good fattening grass, actual nutritive comparisons with Mitchell grasses are difficult to make, since the analyses of grasses at different stages of growth and in different districts show quite a wide variation. It must also be remembered that, whereas Flinders grass is an annual and only lasts a few months, the Mitchell grasses are perennial and last a number of years.

Poisonous Plants and Some Others.

G.R.S. (Biggenden)—

1. A daisy burr, *Calotis cuneifolia*.
2. Barbed-wire vine, *Smilax australis*.
3. Common lantana, *Lantana camara*.
4. Yellow-wood, *Vitex acuminata*.
5. White passion vine, wild passion vine, *Passiflora alba*.
6. Berry saltbush, *Rhagodia hastata*.

Of these plants, Nos. 3 and 5 are known to be poisonous. The remainder are not known to cause trouble in stock. A pamphlet on the lantana and its poisonous properties has been posted to you, and it will give you an idea whether it is the lantana which is the cause of the trouble.

We are referring your letter to the Director, Animal Health Station, Yeerongpilly, for an account of the symptoms caused by wild passion vine, *Passiflora alba*.

Peach leaf poison bush (*Trema aspera*) occasionally develops a prussic acid forming substance, and is then poisonous.

Cestrum Parqui.

J.R. (Yeerongpilly)—

The specimen is from *Cestrum parqui*. The plant is poisonous. It contains parquine, a poisonous alkaloid, the action of which is similar to that of strychnine and atropine. The species is a native of Chili. We have noticed that the odour of the flowers changes during darkness. In the daytime is is faint and disagreeable, resembling that of the crushed leaves. At night, however, the odour is very pleasant and spice-like, and much stronger than in the daytime.

Narrow-leaved Carpet Grass.

D.T.A. (South Johnstone)—

The specimen is narrow-leaved carpet grass, *Axonopus affinis*. It is generally regarded as quite a useful fodder on poorer sandy country where better grasses will not thrive, although it is not so good as another species, broad-leaved carpet grass, *Axonopus compressus*. Both grasses have caused a good deal of controversy in Southern Queensland and the northern New South Wales dairying districts, where it is said of them that they enroach on the better-class paspalum pastures and lower their carrying capacity.

Rural Topics

Eggs in the Balance.

Should eggs be sold by number or weight? Eggs of the domestic hen have been regarded for untold centuries as one of the most nourishing and palatable of foods. Eaten raw or cooked in any one of a hundred ways, they formed a staple article of diet long before men of science discovered their vitamin content. Their abundance or scarcity has ever been a matter of moment to housekeepers and cooks.

One aspect of egg production which has always been a source of complaint to the shrewd housewife is the varying sizes in which eggs are laid. A suggestion has been made by an influential deputation to the Minister for Agriculture in Victoria that eggs should be sold retail by weight and not by number. The Minister, who expressed a well-founded belief that eggs had been sold by the dozen for at least 2,000 years, thought the proposal "pretty revolutionary." He was promptly given figures which were claimed to prove that the present way of selling eggs is no good to either the poultry farmer or the housewife. Weights quoted by the deputationists showed that many eggs sold weighed less than two ounces, while larger eggs were picked out by retailers and sold at a higher price, of which the poultry farmer got no benefit. It was further claimed that producers should be paid for what they sold, and consumers should get exactly what they paid for. The suggestion is "under consideration."

Offences Against Good Marketing.

What amounts to "courts of correction," with chairmen possessing legal qualifications and experience, will be set up to deal with offenders against the agricultural marketing schemes, if proposals made by a departmental committee are adopted by the British Government.

This committee was appointed by the British Treasury to consider the powers of marketing boards to impose and recover fines from offending farmers. The committee points out that the marketing boards in Great Britain have had to build up their procedure without statutory precedents to guide them, and expresses the view that the boards have done their best to carry out their difficult task of maintaining marketing discipline with dignity and justice.

Lawn Clippings as Silage.

In Wiltshire, England, the question of disposing of grass clippings from lawns and fields has been profitably solved. When grass is cut continually during the growing season, the clippings on one property, estimated to amount to about 40 tons, are converted to ensilage. Two low silos were built at a cost of about £4 each. The cut grass was evenly spread, trodden, and uniformly sprayed with a 2 per cent. solution of molasses. The temperature aimed at was 80 deg. Fahr. The grass was analysed before and after six months' treatment, and was fed to cattle as a supplement to hay. The 45 tons of silage actually obtained led to a saving of at least 20 tons of hay. There is an idea worth considering in that report.

Stock Food from Sharks.

In England, 80 per cent. of the concentrated feed to stock and poultry comprises fish meal. In an endeavour to introduce fish meal and fish oil obtained from sharks on the Australian coast, a southern fishery firm has bought sufficient plant for installation at a Blacktown piggery, near Penrith, New South Wales, to exploit shark by-products, which, at present, are dumped as waste.

Although pigraising is only a sideline to the firm's trawling activities, the farm is run on strictly practical lines with some of the best blood stock procurable.

A new machine will be one of the first, if not the first, of its kind in Australia. It cooks the shark and turns it out as fish meal in one operation. Only the head, liver, and fins are removed, the balance being taken by the machine, which, after cooking it for four hours, grinds it fine. The heads of the sharks have to be rejected because of their high glue content, but nothing else is lost. The fins are dried and supplied to the local Chinese community, who take as many as can be supplied. From the shark liver comes the valuable fish oil, extracted under great pressure. All the pigs shown by the owners of the enterprise at the last Sydney Show were in the award list.

Farm Notes

OCTOBER.

CULTIVATORS or scufflers should be kept moving through early-sown raw crops in order to eradicate weed growth and maintain a surface mulch, for much of the summer rains falling on a caked surface soil will not penetrate to any great depth. To check losses of soil during summer storms, all raw crops should be sown at right angles to or athwart the prevailing slope.

Sowings of maize, sweet sorghums, grain sorghums, sudan grass, millet, cowpea, peanuts, pumpkins, melons, may be continued and sweet potatoes planted out.

Increased attention may be given to the sweet sorghums such as ''Saccaline,'' both in the coastal areas and on the Downs. On the Downs the crop has been profitably fed to cattle, horses, and sheep.

For the western Downs and Maranoa, farmers are advised to make sowings of sudan grass, which has proved outstanding in recent years as a summer crop, being utilised for grazing, hay, or silage.

An endeavour should be made to reduce the tonnage of feedstuffs annually brought in from the Southern States, for with the exception of oat grain, and possibly small quantities of prime oaten chaff, local growers should be in a position to provide State requirements of lucerne, wheaten and oaten chaff, sudan chaff, millet, and panicum chaff, stover, and other fodders.

Some interest is also being taken in the cowpea as a summer growing fodder plant rich in protein, which can be grazed, or converted into hay or silage (in combination with maize or sorghum). Suitable varieties are groit, poona, brabham, and black. October is an opportune month for the establishment of summer grasses, chiefly paspalum and Rhodes. Paspalum may be broadcast on scrub burns or ploughed land of reasonably high fertility, at the rate of 8-12 lb. seed per acre, adding white clover seed at the rate of 2 lb. per acre. Rhodes grass, which is preferred in districts too dry to support paspalum, may be sown from October to January, the ashes left after the burning of timber on scrub land providing an excellent seedbed.

No useful results are obtained by broadcasting Rhodes or other grasses on uncultivated land other than a scrub ''burn,'' as it is essential to plough or renovate sufficiently to provide cover for the seed. From 4 to 6 lb. of tested seed per acre will usually provide a good stand.

In the wheat areas, hay-making will be in progress where crops are not too far advanced for this purpose. Crops cut a few days after the flowering stage will contain the maximum nutritive value, the nutriment being then spread evenly throughout the plant.

A greater tonnage can be obtained by cutting at a later stage, but only at the expense of feeding value and colour.

As harvesting becomes general during November, all necessary machinery should be given a thorough overhaul, in order to avoid stoppages at a critical period.

THE VALUE OF FARM EXPERIMENT PLOTS.

An experiment plot on a farm in any district is valuable to all the farmers in the district, as it gives a definite guide as to local crop needs. Take a fertilizing experiment, for example; soil conditions vary in different localities, and, consequently, a fertilizer which gives good results in one place may show nothing like similar results in another. Therefore, it is suggested that a point should be made of visiting any experiment plot which has been laid down in a farmer's own neighbourhood, and see for oneself the results obtained from the different fertilizers used in the plot. The same principle applies to any other kind of experiment plot.

Orchard Notes

OCTOBER.

THE COASTAL DISTRICTS.

OCTOBER is usually a dry month over the greater part of Queensland, consequently the advice given in the notes for August and September on the necessity of thorough cultivation to retain moisture may be again emphasised. Thorough cultivation of all orchards, vineyards, and plantations is imperative if the weather is dry, as the surface soil must be kept in a state of soil mulch.

All newly planted trees should be watched carefully and if they show the slightest sign of scale or other pests they should receive attention at once.

Bananas.

In the warmer districts, banana planting may be continued. All winter trash should be removed and the stools cleaned up. If not already done, before the winter, young plantations planted the previous season should be desuckered without delay. Those desuckered last autumn should be gone over again, and old plantations also should receive attention. Grow to each stool the number of stems which experience proves to be permissible, but only allow each stem to grow a single follower. Borers will be active again soon, and trapping should be intensified towards the end of the month and supplies of Paris green and flour (one part to six by weight) made up in readiness. Caterpillar and grasshopper plagues often occur from the end of the month onwards, and it is wise to lay in a supply of arsenic pentoxide for use in the preparation of bran baits. Watch the plantation carefully for bunchy top, and kerosene and destroy any affected plants without delay. The season of vigorous growth is now commencing, and it will pay well in more and better fruit and in stronger suckers for the next crop to apply a dressing of a complete fertilizer to each stool. Cultivate well to retain moisture, aerate the soil, and kill weeds before they seed. This will also prepare the soil for the planting next month of a green cover crop such as *Crotalaria goreensis*, thus shading the soil, preventing erosion on slopes, and enriching the soil with nitrogen and humus.

Clean out all banana refuse from the packing shed, and resolve not to allow it to accumulate in future. This will reduce the risk of the development of many fungus rots in the packed fruit.

Pineapples.

From now onwards pineapples may be planted in most districts. Plough thoroughly, remembering always that in the life of a plantation will be several years during which it will be neither possible nor desirable to do more than disturb the surface layer. Obtain advice from the Department of Agriculture and Stock as to whether the soil is sufficiently acid, and, if not, how much sulphur to apply. Care should be taken in the layout of the rows to save time and labour in cultivation and harvesting, and minimise erosion. Select planting material with discrimination from healthy and vigorous plants of a good bearing type. Beware of planting "collars of slips." Always strip off the base leaves and dry in the sun for a few days, and plant shallow. As soon as the roots form, apply 3 cwt. of 10-6-10 fertilizer to the acre. All established plantations are due for their spring fertilizer at the rate of not less than 5 cwt. per acre. Keep down weeds wtih the Dutch hoe; but do not disturb the soil deeply, always remembering that the pineapple is shallow-rooted and receives a sharp setback if the roots are cut or disturbed with horse-drawn implements. Clean out all pineapple refuse from the packing shed and surroundings, and thus prevent much fungus trouble in the summer pack.

THE GRANITE BELT SOUTHERN AND CENTRAL TABLELANDS.

MUCH of the matter contained under the heading of "The Coastal Districts" applies equally to the Granite Belt and the Southern and Central Tablelands, for on the spring treatment the orchard and vineyard get the succeeding crop of fruit very largely depends. The surface of all orchards and vineyards should be kept loose. In the western districts, irrigation should be given whenever necessary, but growers should not rely on irrigation alone, and should combine it with the thorough cultivation of the land so as to form and keep a fine soil mulch to prevent surface evaporation.

All newly planted trees should be looked after carefully and only permitted to grow the branches required. All others should be removed as soon as they appear. If there is any sign of woolly aphis, peach aphis, or scale insects, or of any fungus disease on the young trees, they should be dealt with at once by the use of such remedies as black leaf forty, Bordeaux mixture, or a weak oil emulsion. In older trees, similar pests should be systematically fought, for if kept in check at the beginning of the season the crop of fruit will not suffer to any appreciable extent. Where brown rot has been present in previous years, the trees should be sprayed with Bordeaux mixture and lime sulphur according to the schedule recommended by the Department. All pear, apple, and quince trees should be sprayed with arsenate of lead—first when the blossom is falling, and at intervals of about three weeks. Spraying for codling moth is compulsory in the fruit district of Stanthorpe, and wherever pomaceous fruit is grown it must be attended to if this insect is to be kept in check.

In the warmer parts a careful check should be kept for any appearance of the fruit fly, and, should it be found, every effort should be made to trap the mature insect and to gather and destroy any affected fruit. If this is done, there is a good chance of saving much of the earlier-ripening summer fruit, if not the bulk of the crop. Tomato and potato crops will require spraying with Bordeaux mixture, likewise grape vines. Keep a very strict watch on all grape vines, and, if they have not been treated already, do not delay a day in spraying if any sign of an oil spot, the first indication of downy mildew, appears on the top surface of the leaf. Spraying with Bordeaux mixture at once, and following the first spraying up with subsequent sprayings, if necessary, will save the crop, but if this is not done and the season is favourable for the development of the particular fungus causing this disease, growers may be certain that their grape crop will not take long to harvest.

Where new vineyards have been planted, spraying also is very necessary, for if this is not done the young leaves and growth are apt to be affected so badly that the plant will die.

THE BRANDING OF STOCK.

The attention of stockowners is directed to the necessity for following the rules of branding, especially in regard to re-branding.

The Brands Act provides that the second or subsequent brander must, if there is room, imprint his brand on his stock at a distance of not less than 1½ inches nor more than 2½ inches from and directly underneath the previous brand.

If there is not room, the re-branding must be done on the next succeeding position, *and on the same side of the animal as the preceding brand in the case of cattle,* thus confining the branding of cattle to one side.

The size of all brands is restricted to not less than 1¼ inches in length, or more than 2½ inches in length for horses and cattle.

Owners are advised to note their obligations in these matters, the observance of which will help to lessen the present unnecessary deterioration of hides through excessive and incorrect branding.

Our Babies.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

FATHERCRAFT.

MOST people are familiar with the word "Mothercraft" and understand in a general way that it has to do with the preparation for motherhood and with the correct methods of feeding, care, and management of the child after he arrives. With the word "Fathercraft" people are not so familiar. The fathercraft movement has been in existence in certain countries for some years, and came into being in order to interest and educate fathers in maternal and child welfare. In these countries fathers meet and discuss problems associated with welfare work, and lectures are given by specialists on its various activities. Opportunities are provided for personal interviews in regard to children whose nutrition or management has proved difficult. Experience has shown that these interviews are of greater value than lectures given to a large audience.

Child's Physical and Mental Welfare.

Fathercraft deals not only with the physical, but also with the mental welfare of the child. While much of the actual care and handling of the young child is necessarily in the hands of the mother, the training of the child's mind is shared by both parents, even from the earliest days. Certain activities come entirely within the province of the father and others within the province of the mother. It is necessary that the father should understand the responsibilities of motherhood, and should appreciate the mother's outlook in order that he may give her the support which is necessary for the harmonious working of the household.

Fitness for Fatherhood.

Naturally one of the first questions a man who contemplates marriage should ask himself is whether he is fit to become a father. If any doubt exists, he should not hesitate to seek medical advice. Such advice may reassure him.

When Should Fathercraft Begin?

The responsibility for the child's upbringing begins with conception. What a husband does for his wife during the expectant period is not only for her own sake but for the sake of the unborn child. As was pointed out in our article last month, the husband must see that his wife has not only sufficient food, but food of the right kind, that she has regular exercise, recreation, sleep, fresh air, sunshine, and freedom from worry.

The Newly-made Father.

The newly-made father must learn the advantage of breast feeding in order that he may be able to advise and encourage his wife to feed baby naturally. Too often it is found that the child is taken off the breast shortly after the second week of life. This coincides with the return of the mother to her home with its added responsibilities. In other words the mother who has had almost everything done for her in the hospital resumes her household duties, and at the same time assumes the care of the young baby before natural feeding is fully established in some instances. If she becomes over-anxious or worried her supply of milk will diminish, and consequently her difficulties will increase. It is then that the husband should encourage his wife to obtain the assistance of a welfare trained nurse or seek advice at the nearest clinic, either personally or by letter.

It is not intended to convey the impression that it is only when she gets into difficulty that a mother should consult the clinic nurse. On the contrary she should obtain advice while the child is well, in order that she may be saved from falling into errors and that her child may be kept well. The father will be playing his part if he encourages the mother to attend the clinic regularly. "Prevention is better that cure" is the motto of the Maternal and Child Welfare Service.

The emotions have considerable influence on the secretion of milk, as many mothers are aware from actual experience. Consequently the father should do what he can towards creating an environment which will promote a feeling of quiet, calm, confidence in his wife.

The Toddler.

As the toddler stage is reached, the father's interest usually increases. He should encourage his wife to continue her visits to the clinic, in order that the child's feeding and management may be supervised. This is done with the object of keeping him fit and well, and in order that any departure from a normal state of health or behaviour may be detected at a time when its correction is relatively easy. Periodic visits to the dentist should be arranged.

New accomplishments mark the child's progress—new words learned, new acts performed, all indicating the development which is proceeding steadily. In regard to his behaviour, much will depend upon the extent to which companionship and goodwill exist in the house. If the parents, by intelligent handling and sympathetic understanding in the

early years, have gained the confidence of the child, co-operation will be readily established, and problems associated with his upbringing later will be more easily solved.

It comes within the father's province to entertain his child by various forms of play—by reading or telling stories—and in other ways.

As companionship with children of his own age is important in his development, the child should be given an opportunity of mixing with them under supervision. The valuable part played by nursery schools and kindergartens in this respect has been referred to in previous articles.

You may obtain information on all matters concerning infant and child welfare by visiting the nearest Maternal and Child Welfare Centre (Baby Clinic), or by writing to the Sister in Charge, or by communicating direct with the Maternal and Child Welfare Centre (Baby Clinic), Alfred street, Fortitude Valley, N. 1, Brisbane.

IN THE FARM KITCHEN.

APPETITE TEMPTERS.

For the 'Flu Convalescent.

Beef Tea.

Take 1 lb. shin beef, 1 pint cold water, salt.

1. (NOT COOKED.)

Remove the fat, if any, then scrape the meat into shreds and put into an earthenware jar or basin. Add the water and a little salt, and leave to soak until the goodness is drawn out of the meat, then strain and serve.

2. (QUICK METHOD.)

Prepare meat as above and put into a basin with the water and salt. Leave to soak for about forty minutes, then turn into a saucepan and bring very slowly almost to boiling point. Stir it up, then strain, and press the meat well to extract all the gravy; re-heat and serve with fingers of dry toast.

3. (SLOWLY MADE.)

Prepare the meat as above or cut it into small pieces, and put into a jar with the water and salt. Let it soak for a time, then stand the jar in a saucepan of water or in the oven. Cover it securely and cook slowly for three hours, being careful not to let it boil.

Chicken Broth.

Take some chickens' feet, cold water to cover well, salt, pepper, ½ onion, and carrot. To 1 pint of broth allow 1 egg.

Scald and skin the chickens' feet, then put them into a saucepan with cold water to cover them well, and a little salt. Bring slowly to the boil, then remove any scum there may be on top. Peel the onion, scrape and wash the carrot, and add both, not cut up, and simmer gently for three or four hours, then strain. Measure the broth, allow the eggs in proportion, beat them well, and mix with it. Turn into a jug, and cook in a saucepan of hot water until the broth thickens, being careful not to let it boil. Season to taste and serve.

Steamed Fillets of Whiting.

Take 2 whiting fillets, white sauce.

Have the whiting filleted and the fillets skinned. Roll them up, place on an enamel plate, and stand over a saucepan of boiling water. Cover the fish with a buttered paper and a basin and steam. When cooked the flesh will be quite white. Serve with plain white sauce.

Egg and Milk.

When preparing an egg and milk for an invalid never omit to remove the little white "tread" before whisking the egg. Whisk it well—then stir in hot or cold milk. Add a little castor sugar, if liked. A dash of brandy is a great improvement, or a spoonful of port wine may be added.

Fish Scallops.

Take 1 cupful cold fish, 2 medium potatoes, 1 oz. butter, 1 dessertspoonful anchovy essence, pepper, ½ tablespoonful chopped parsley, ½ gill milk.

Wash, peel, and boil the potatoes. Chop the fish, first removing the skin and the bones. When potatoes are tender drain off the water and put the pan over a low gas. Mash the potatoes with a fork and stir in the fish, anchovy, milk, pepper, and half the butter. Beat this mixture till smooth, put it into greased scallop shells with dabs of butter on top. Brown the scallops under the griller and sprinkle with parsley. Serve with thinly-sliced brown bread and butter.

Steamed Chop.

Take 1 mutton chop, ½ oz. butter, a little chopped parsley, seasoning, teaspoonful lemon juice. Cream butter and seasoning and chopped dry parsley. Add lemon juice drop by drop. Form into little pats. Trim off any superfluous fat. Place on a buttered plate, cover with another plate, and steam as for fish. Season and serve on a hot plate with the liquid poured round, and with a small pot of maitre d'hotel butter.

Fricassee of Tripe.

Take ½ lb. cooked tripe, 1 teaspoonful cornflour, a small piece of cooked onion, 1 gill milk, 1 egg-yolk seasoning.

Cut up the tripe in small pieces. Chop the onion and put them both in a pan with the milk. Simmer gently for ten minutes. Add the seasoning and blended cornflour. Cool slightly and add the beaten egg-yolk. Serve with strips of toast.

Poached Egg on Toast.

Toast a slice of bread, butter it, and keep it warm. Break the egg carefully into a cup, being careful not to break the yolk. Put some water into a small frying-pan, add a little salt and lemon juice, and boil; then draw aside. Pour in the egg and cook gently over a low burner for a few minutes until the white is set, keeping the pan slightly tilted at first. Lift up with a fish slice, and drain off the water, then serve on the toast.

Plain Omelet.

Take 2 eggs, ¾ oz. butter, pepper, and salt.

Separate the yolks from the whites of the eggs. Beat up the yolks and season with pepper and salt. Add a pinch of salt to the whites and whisk them to a very stiff froth, then fold lightly into the yolks. Melt the butter in an omelet pan. When hot, pour in the egg mixture. When it begins to set round the edge, fold the edge over and draw the omelet towards the handle of the pan, keeping the latter tilted that way. Continue to cook for a few seconds, then put under the hot griller and lightly brown on the top. Turn on to a hot dish and serve at once.

Invalid Egg Jelly.

Take 2 eggs, ½ oz. gelatine, 3 oz. lump sugar, 2 lemons or oranges.

Put into a saucepan the well-beaten eggs, gelatine, sugar, sliced lemon (or orange) rind, and one pint of liquid consisting of the juice of the two lemons (or oranges) and water. Stir continuously over a gentle heat until mixture thickens. On no account allow it to boil. Strain when hot and allow to cool a little before putting into a mould which has been rinsed out with cold water.

A Cold Sweet.

Separate the yolk and white of an egg. Add one teaspoonful of castor sugar to the yolk and whisk until thick and creamy. Dissolve one sheet separately. Fold the white into yolk and add leaf of gelatine in a tablespoonful of water and strain into the yolk, then, when beginning to set, whisk the egg-white to a stiff froth and fold in lightly. Add a few drops of vanilla or orange essence, then turn into a small glass dish to set. Before serving place a cherry (glace) in the centre.

Sponge Tart.

Take 1 apple, slices of sponge cake, 2 teaspoonfuls sugar, 1 egg, 1 gill milk, 1 teaspoonful castor sugar.

Bake an apple till very soft. Take out all the fruit and place in a small dish. Put some slices of sponge on top. Make a custard with milk, egg-yolk, and a little sugar. Pour over the sponges. Whisk up the egg-white with one teaspoonful castor sugar and put on top of the pudding. Place in a cool oven and bake till set and slightly brown. Serve hot or cold.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JULY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1939 AND 1938, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	July.	No. of years' records.	July, 1939.	July, 1938.
	In.		In.	In.
North Coast.				
Atherton	1·14	38	0·91	2·85
Cairns	1·58	57	0·53	2·03
Cardwell	1·39	67	0·47	2·66
Cooktown	0·96	63	0·58	0·71
Herberton	0·90	53	0·32	2·37
Ingham	1·69	47	1·33	4·58
Innisfail	4·80	58	3·78	8·17
Mossman Mill ..	1·34	26	..	2·20
Townsville ..	0·66	68	0·07	3·68
Central Coast.				
Ayr	0·72	52	..	3·30
Bowen	0·94	68	0·10	2·61
Charters Towers ..	0·66	57	0·26	1·91
Mackay P.O. ..	1·69	68	0·32	3·03
Mackay Sugar Experiment Station	1·50	42	0·15	2·43
Proserpine ..	1·58	36	1·85	2·68
St. Lawrence ..	1·38	68	0·20	1·68
South Coast.				
Biggenden ..	1·41	40	2·64	3·24
Bundaberg ..	1·88	56	1·47	4·29
Brisbane	2·21	87	2·00	1·43
Caboolture ..	2·15	52	2·80	2·04
Childers	1·73	44	2·18	2·98
Crohamhurst ..	2·95	46	2·80	3·21
Esk	1·97	52	2·37	2·86

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	July.	No. of years' records.	July, 1939.	July, 1938.
	In.		In.	In.
South Coast—contd.				
Gatton College ..	1·40	40	..	1·32
Gayndah	1·48	68	2·75	2·67
Gympie	2·09	69	2·81	2·44
Kilkivan	1·60	60	2·00	2·35
Maryborough ..	1·95	68	2·89	3·98
Nambour	2·70	43	3·41	3·99
Nanango	1·68	57	1·81	3·39
Rockhampton ..	1·77	68	0·45	2·05
Woodford	2·34	52	2·37	2·64
Central Highlands.				
Clermont ..	1·06	68	1·42	2·80
Gindie	1·10	40	1·33	0·95
Springsure ..	1·21	70	1·20	0·71
Darling Downs.				
Dalby	1·73	69	2·17	2·19
Emu Vale ..	1·59	43	1·94	1·50
Hermitage ..	1·69	33	..	0·88
Jimbour	1·53	51	1·48	1·91
Miles	1·64	54	1·66	1·47
Stanthorpe ..	2·03	66	1·50	1·74
Toowoomba ..	2·09	67	2·14	2·30
Warwick	1·83	74	1·50	1·34
Maranoa.				
Bungeworgorai ..	1·37	25	..	0·45
Roma	1·45	65	1·64	0·34

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JULY, 1939.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·99	78	63	82	4, 10	55	12	58	7
Herberton	..	71	48	77	1, 8	30	13	32	7
Rockhampton	30·10	71	52	81	2	43	14	45	5
Brisbane	30·13	66	49	76	18	40	26	200	9
Darling Downs.									
Dalby	30·16	63	39	71	17	27	26	217	7
Stanthorpe	..	56	32	65	30	21	26	150	8
Toowoomba	..	59	43	69	6	30	26	214	5
Mid-Interior.									
Georgetown	30·02	79	51	87	1	33	13	21	2
Longreach	30·11	69	46	79	29	37	12	96	4
Mitchell	30·15	61	41	72	16, 17, 31	28	26, 27	207	8
Western.									
Burketown	30·05	79	54	85	1, 3, 17	42	6	5	1
Boulia	30·15	65	48	80	29	37	9, 10	250	6
Thargomindah	30·13	62	43	74	17	34	24	76	6

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	September, 1939.		October, 1939.		MOONRISE. Sept., 1939.	MOONRISE. Oct. 1939.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	6·7	5·37	5·33	5·51	7·37	8·12
2	6·6	5·37	5·31	5·51	8·30	9·7
3	6·5	5·38	5·30	5·52	9·23	10·3
4	6·4	5·38	5·29	5·53	10·16	11·0
5	6·3	5·39	5·28	5·53	11·11	11·52
6	6·2	5·39	5·27	5·54	..	..
					a.m.	a.m.
7	6·0	5·40	5·26	5·54	12·5	12·24
8	5·59	5·40	5·25	5·55	1·4	1·33
9	5·58	5·41	5·24	5·56	2·0	2·21
10	5·57	5·41	5·23	5·56	2·53	3·6
11	5·56	5·42	5·22	5·57	3·43	3·51
12	5·54	5·42	5·21	5·57	4·29	4·35
13	5·53	5·43	5·20	5·58	5·16	5·19
14	5·52	5·43	5·19	5·58	6·2	6·4
15	5·50	5·44	5·18	5·59	6·46	6·50
16	5·49	5·44	5·17	5·59	7·30	7·41
17	5·48	5·45	5·16	6·0	8·15	8·31
18	5·47	5·45	5·15	6·1	9·2	9·23
19	5·45	5·45	5·14	6·1	9·50	10·17
20	5·44	5·46	5·12	6·2	10·42	11·9
21	5·43	5·46	5·11	6·3	11·33	p.m.
					p.m.	12·3
22	5·42	5·47	5·10	6·3	12·26	12·51
23	5·41	5·47	5·9	6·4	1·17	1·44
24	5·40	5·47	5·8	6·5	2·10	2·36
25	5·39	5·48	5·8	6·5	3·0	3·25
26	5·38	5·48	5·7	6·6	3·51	4·17
27	5·37	5·49	5 6	6·7	4·37	5·11
28	5·36	5·49	5·6	6·7	5·32	6·6
29	5·35	5·50	5·5	6·8	6·24	7·2
30	5·34	5·50	5·4	6·8	7·18	7·57
31			5·3	6·9		8·53

Phases of the Moon, Occultations, &c.

7th Sept.	☾	Last Quarter	6 24 a.m.
13th ,,	●	New Moon	9 22 p.m.
20th ,,	☽	First Quarter	8 34 p.m.
29th ,,	○	Full Moon	12 27 a.m.

Perigee, 13th September, at 4.0 a.m.
Apogee, 25th September, at 7.0 p.m.

On the 24th of September at 9 a.m. our Vernal Equinox will occur. The Sun will cross the equator from north to south, and on this day rise due east and set due west.

In our Luminary's apparent motion we see as in a mirror the real motion of the Earth, and this our planet has arrived at a point in its orbit midway between the Winter and Summer solstice. Each hemisphere receives the same amount of light, and as our globe, fortunately for us, turns on its axis, the same amount of darkness also—which is to say that day and night are of equal length all over the world.

On the 27th Jupiter will be in "Opposition," and being nearest the Earth will seem larger and brighter than at any other time during this year.

Mercury rises at 5.15 a.m., 52 minutes before the Sun, and sets at 4.17 p.m., 1 hour 20 minutes before it on the 1st; on the 15th it rises at 5.37 a.m., 13 minutes before the Sun, and sets at 5.13 p.m., 31 minutes before it.

Venus rises at 6.7 a.m., with the Sun, and sets at 5.31 p.m., 6 minutes before the Sun on the 1st; on the 15th it rises at 6.1 a.m., 11 minutes after the Sun, and sets at 5.55 p.m., 11 minutes after it.

Mars rises at 2.3 p.m. on the 1st, and sets at 4.3 a.m. on the 2nd; on the 15th it rises at 1.19 p.m., and sets at 3.21 a.m. on the 16th.

Jupiter rises at 7.43 p.m. on the 1st, and sets at 7.43 a.m. on the 2nd; on the 15th it rises at 6.40 p.m., and sets at 6.44 a.m. on the 16th.

Saturn rises at 9.30 p.m. on the 1st, and sets at 8.58 a.m. on the 2nd; on the 15th it rises at 8.31 p.m., and sets at 8.1 a.m. on the 16th.

A total eclipse of the Sun will occur on 12th October in the Antarctic Circle. Of a partial eclipse the greatest phase will be seen about sunrise on the east coast of Australia from Melbourne to Maryborough, and the end through South Australia to near Townsville.

6th Oct.	☾	Last Quarter	3 27 p.m.
13th ,,	●	New Moon	6 30 a.m.
20th ,,	☽	First Quarter	1 24 p.m.
28th ,,	○	Full Moon	4 42 p.m.

Perigee, 11th October, at 11 a.m.
Apogee, 23rd October, at 9 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.

Vol. LII. 1 OCTOBER, 1939 Part 4

Event and Comment

Rural Industry in Other Lands.

WHILE abroad on his recent mission of investigation, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, observed many things of interest to Queensland farmers. In the course of a recent address, he reviewed very interestingly some of his impressions of rural industry in countries where conditions of primary production resemble our own.

Making Durban, South Africa, his starting point, Mr. Bulcock commenced a tour through Natal and the other provinces of the Union. The sugar industry in Natal impressed him with its high standard of technical efficiency, patterned largely on the Australian model. In Johannesburg he was amazed at the high prices realised at auction for cattle of inferior quality. The explanation was that huge quantities of meat were required for the labourers in the surrounding gold mines. South Africa, he said, was endeavouring to build up a chilled beef trade and the authorities there were doing all in their power to foster the

project. The Government of the Union subsidised chilled meat export, but he regarded it as doubtful whether many growers would be attracted by the prospects of an industry governed by international price levels, and for which grain feeding of stock was advocated.

Probably the most impressive agricultural institution in South Africa, he said, was the Onderstepoort Animal Research Station, near Pretoria. There a complete and complex series of experiments was being carried on, together with research work on an elaborate scale. Probably at that institution there was assembled the greatest number of agricultural science workers in any similar organisation in any part of the world. The reason for this was the nature of the task with which the South African stockowner is confronted, for major animal disease problems constitute a producer's nightmare. Australians, in Mr. Bulcock's opinion, are very fortunate in their comparative freedom from the necessity of having to contend with similar problems. Continuing, he said that agricultural education in South Africa extended over a wide field, and was provided for by universities and agricultural colleges, all of a high standard in respect of staffs, equipment, and achievement. The universities also were associated with field research and experiment work, and several of them had their own farms for the practical application of scientific developments and discoveries, from which important results had been obtained and which had had, in many cases, far reaching effects on the welfare and progress of rural industry throughout the Union and neighbouring countries.

To an Australian, the merino wool industry in the Union was of special interest, but it was, apparently, beset with serious difficulties, including limitation of the size of grazing areas in relation to economic production; absence of timber and shade; low pasture values; soil erosion; smallness of stud flocks and consequent limitation of selection; and difficulty in obtaining new blood. All these factors had led to the conclusion that South Africa was not likely to become a serious competitor with Australia in the production of merino sheep and wool. Many stud masters were, however, doing excellent work in co-operation with a progressive and well-equipped Department of Agriculture. A fat lamb industry also was being developed along sound lines and largely on a Dorset Horn foundation.

South Africa, too, had realised that production without organised marketing would be an incomplete agricultural structure, and so the economics of rural industry had become an important part of the rural policy of the Union.

The next country visited by Mr. Bulcock was Argentina, which he found to be a land amazingly rich in agricultural and pastoral resources. The magnificence of its capital, Buenos Aires, with its population of 3½ millions, and its air of solid prosperity, was evidence

of the wealth of its rural industries, for that country lived almost entirely on primary production. Argentina impressed him as probably one of the greatest developed agricultural countries in the world, with a diversity of production which few could equal. Cattle raising was the chief industry, and his first introduction to it was at a quarantine station where nearly 200 bulls were housed. These animals, all showing exceptional quality, were British importations, averaging £800 sterling in purchase price. Another bull he saw was a huge Hereford, which carried a reserve price of £3,400 sterling. The Argentine cattle breeder paid a high price for sires, he knew just what he wanted, and went out to get it. "It is need, not price, that determines his purchases," added the Minister. The stud stock importing policy of the Argentinian had resulted in the transformation of cattle to super-beef cattle, with, under favourable conditions, early maturing qualities. A visit to a meatworks showed how successful had been the aims of the breeders. The carcases were all even and strictly graded as to quality. No one could fail to be impressed with the general efficiency of the meatworks of the Argentine, in which hygiene and cleanliness were regarded as matters of supreme importance.

In Argentina the line of demarcation between the breeding and feeding side of the beef cattle industry was as sharply drawn as was the line separating the beef and dairy cattle in Queensland. Stockowners were convinced that it did not pay to breed and feed on the one place. Generally, in Argentina, the breeding lands were the poorer cattle holdings, and from these properties young stock were removed to pastures situated in probably the richest belt of agricultural country in the world. This region, a thousand or so miles long, and 400 miles wide, was a real paradise for the cattle fattener. In this vast region practically no reliance was placed on indigenous pasture, and cereals alternated with lucerne to provide adequate grazing pastures for beasts for the abattoir at not more than two years of age. There was even a tendency to decrease this slaughter age. Probably the best established axiom amongst the cattle men of the Argentine was "Weaners must be well weaned," meaning thereby that they must go on to good pastures, preserve their calf flesh, and continue to grow without any check in development.

Holdings for the raising of fats were highly improved and well managed. Labour conditions on many holdings were not of a high standard, said Mr. Bulcock, although he did visit some places where the stockmen were well cared for. One of the problems of the cattle industry in Argentina was the absence of trees, and to overcome that, extensive shade groves of Australian gums had been planted and had thrived in their new environment. The scent of these gums recalled to the wandering Australian memories of his home land.

Generally, Mr. Bulcock remarked, in conclusion, Australia had much to learn from the countries he had visited, but the volume and quality of agriculture in this country would not suffer by comparison.

Root Distribution of the Banana.

W. A. T. SUMMERVILLE, M.Sc., Senior Research Officer.

WITHIN the past twelve months an extensive programme of research covering many aspects of the culture of the banana in Queensland has been initiated. Though it is desirable that many of the problems be solved as quickly as possible, it is also necessary that, if the results are to have real and lasting value, they be based on as complete a knowledge of the fundamentals as it is practicable to obtain. Thus in connection with fertilizer treatments and soil management problems it is essential that the normal habit of rooting be understood, and to this end a study is being made of the rooting systems of Cavendish bananas growing on a variety of soil types. Whilst this study is, as yet, far from complete, it is felt that some of the information which has been obtained may be of immediate interest and value to banana growers.

TECHNIQUE.

Though it is quite practicable to examine the root system of an individual plant in considerable detail, when it becomes necessary to obtain data from many types of soil and under several other environmental conditions such as different slopes of land, aspects and cultivation methods, it is essential to devise methods which allow of fairly fast work without sacrifice of essential accuracy.

For the purpose of collecting the data here presented three methods have been employed, and the type of information obtained from each may be most readily understood by reading the following descriptions in conjunction with the accompanying diagrams. These methods were adopted following preliminary survey work which gave leads as to the distance from plants and the depths at which roots might be expected to occur.

First Method.

The initial step in the first method is the preparation of a soil profile by digging a trench 2 feet deep in a predetermined position relative to the plant. In each case the trench is dug so that its length is parallel to one row of plants, and this, of course, means that it runs at right angles to the cross rows. The position of the trench is such that if a line be drawn between the bases of the two adjacent plants, this line will bisect the trench. The length of the trench is varied according to local conditions, but generally in practice a trench 8 feet long is dug when the stools are planted on the 9 feet by 9 feet system, and 6 feet long in cases of closer plantings.

When the profile has been carefully prepared the various horizons of soil are noted. At this stage, in most soils, especially if there be an appreciable amount of moisture present, the cut ends of the roots are obscured by smears of soil, and in order to locate each root it is necessary to pick away the soil very carefully, and in small amounts at a time, so that gradually each root in turn may be exposed. Care must be taken to ensure that roots from other plants such as weeds are not confused with those of the banana. After a little practice this does not offer any great difficulty. The position of each is plotted on squared paper and the root then removed to avoid confusion and to facilitate the search.

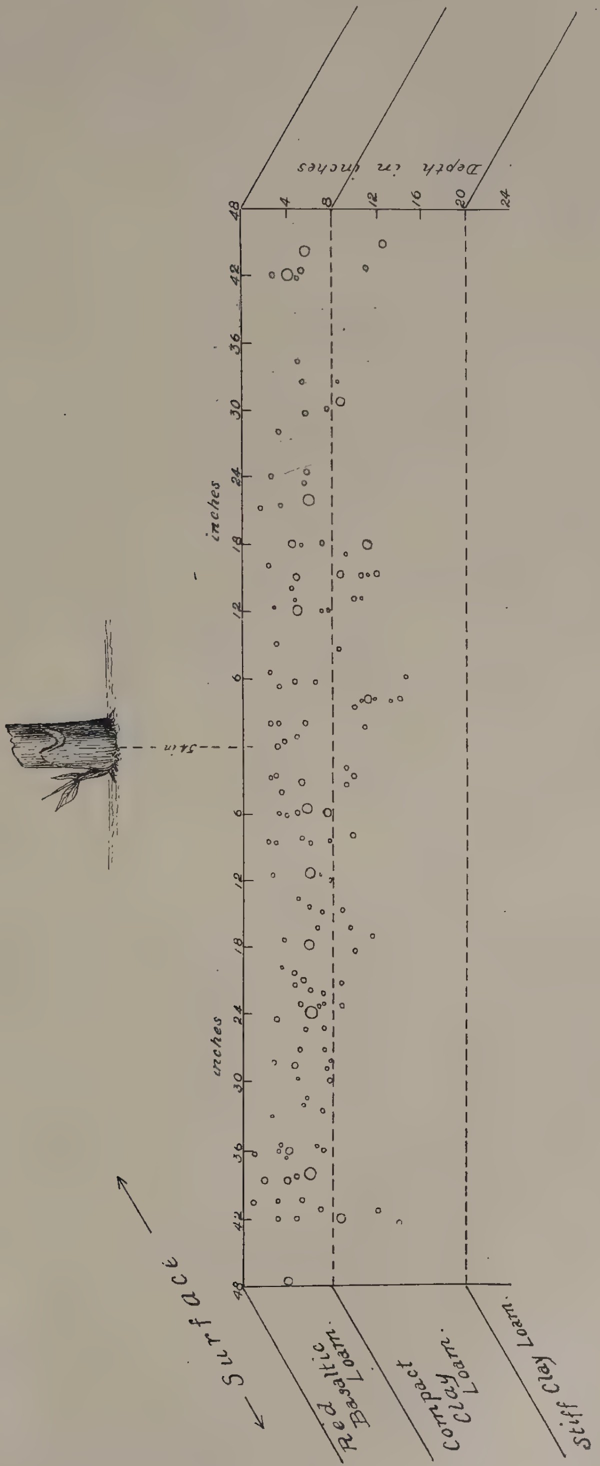

Depth in inches
inches
inches
54 in
Surface
Red Basaltic Loam.
Compact Clay Loam.
Stiff Clay Loam.

Plate 161.

This method has one disadvantage in so far as it is not always easy to decide from which particular plant the root has grown. That, however, is relatively unimportant with respect to most questions, the point which matters being what roots are present. The data obtained by this method may, perhaps, be said to be indicative of the distribution of roots in a plantation, rather than of the distribution of the roots of one plant. Under practical conditions, it can scarcely be claimed that all roots are found, but it is felt that, provided due care has been exercised, a reasonably true picture has been obtained.

Second Method.

The second method is very similar to the first, but in this, what amounts to a series of profiles is prepared. To do this a trench 9 inches wide is excavated, commencing about half way out in the row. The trench is dug in 6-inch series gradually working directly towards the base of the plant. Thus a profile is smoothed at, say, 54 inches from the base of the plant and the roots carefully exposed in just the same manner as in the first method. When work on that face is completed the trench is taken 6 inches nearer the plant and a second face prepared at 48 inches, and so on.

This method has the advantage of making it possible to identify the plant of origin of a large number of the roots, and thus more exact data on the rooting system of any one plant may be prepared.

It is possible too, in this way, to determine more accurately the rooting habits on steep slopes, for it enables the detection of amount and depth of spread above and below the plant and across the slope. This phase is not, however, to be dealt with in this paper.

In plotting the data obtained by this method it is necessary to make records in such a way as to show how the roots occur relative to one another, and to do this, when a root is located it is marked at its depth, and at the same time its distance from the left-hand side of the face is recorded.

Third Method.

In this method a tightly fitting box is built so that the sides may be removed with ease. The cracks between the boards are covered with paper mulch so as to prevent any loss of soil when excess water percolates through it. Following this a hole, as nearly as possible equal to the length, width, and depth of the box, is dug in the ground. In digging this hole the soil is removed in shallow layers, never exceeding 2 inches in depth, and bagged as it is removed. This soil is then placed in the box in the reverse order of its removal from the hole, and the contents of each bag carefully tamped down, so that finally it occupies the same length, width, and depth in the box as it did *in situ* in the field. At each 4 inches a strip of wire netting of 1-inch mesh is stretched horizontally across the box, so that finally when the soil is removed the root cannot move more than 1 inch in any direction except at its end, which portion, of course, could drop 4 inches. Actually roots of any importance in this work have sufficient rigidity to prevent any drop of moment.

Planting material is set in the centre of the box at the usual planting depth and grown for the duration of the test, water being supplied in moderate quantities as required.

Finally, at the end of the determined growing period two opposite sides of the box are removed and the soil carefully washed out with a

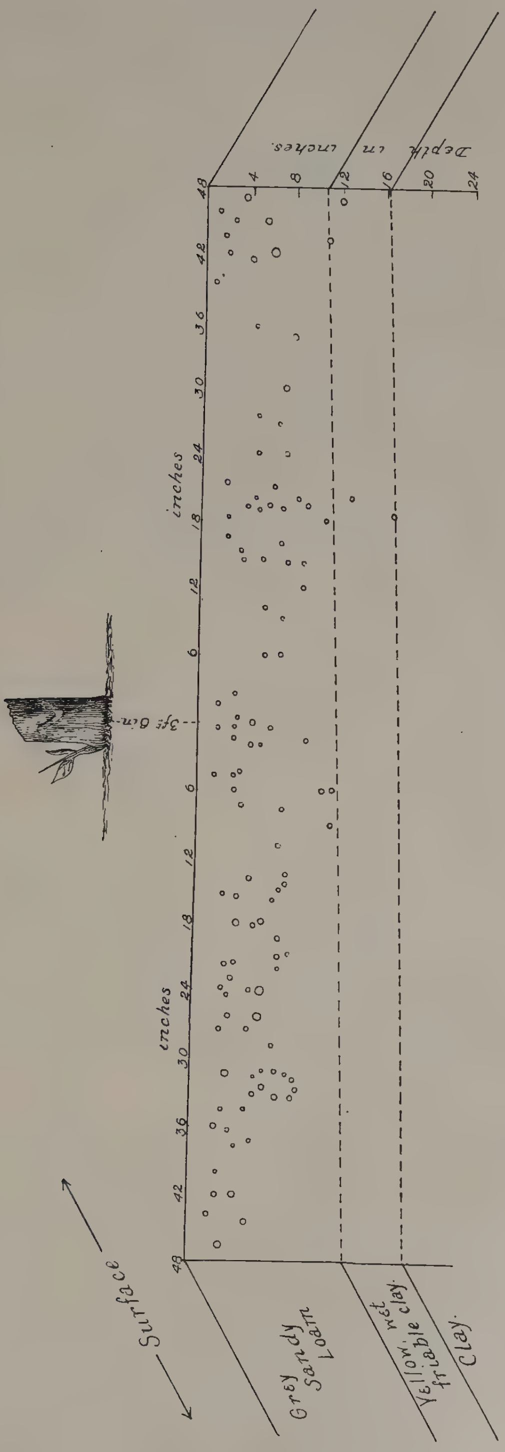

Depth in inches.
inches
inches
3ft 6in.
Surface
Grey Sandy Loam
Yellow, wet friable clay.
Clay.

Plate 162.

garden hose, using a low pressure of water. The time taken to remove the soil depends on its type. In the example case this operation involved ten hours' patient work to ensure that there should be a minimum breaking and displacement.

EXPLANATION OF DIAGRAMS.

Diagram 1.

This diagram (Plate 161) represents a profile exposed at Buderim Mountain on a plantation on almost level land with but a slight tilt to the north-east. The plants were approximately twelve months old and the nearest stool was 38 inches high, with a base 19 inches in circumference. The planting was 9 feet by 9 feet and two dressings of fertilizer had been applied, one four months and the other three months previous to the root survey, which was carried out on 14th December, 1938. The size of the marks may be taken as roughly indicative of the relative sizes of the various roots.

It is to be noted that 139 roots were located at the site of this profile which, at its nearest point, is 4 feet 6 inches from a stool. The land was given shallow cultivation prior to planting and thereafter the surface chipped periodically to remove weed growth. It may be of interest to note that in this instance more than 75 per cent. of the roots are located in the top 8 inches.

Diagram 2.

This specimen (Plate 162) was exposed at Eudlo on a medium slope with a westerly aspect. The profile was located 3 feet 6 inches from the nearest plant and due west from it. That is to say it exposed the roots down the slope from the plant chiefly concerned. This plant was ten months old, 33 inches high, and had a basal circumference of 19 inches. The planting was on an 8 feet by 8 feet basis. This soil is very different from that portrayed in Diagram 1, though the cultural methods employed were essentially the same in both cases. Here 113 roots were found, of which about 80 per cent. were within 8 inches of the surface. The clay, which appears at about 12 inches from the surface, though of high maximum field capacity for water, is pervious and not a serious bar to drainage. It appears, however, to be uncongenial, though apparently not fatal, to banana roots. Here again the size of the marks is roughly indicative of the relative sizes of the various roots. This profile was exposed on 5th September, 1938.

Diagram 3.

This diagram (Plate 163) represents a third, quite different, soil type. This example, which was exposed on 31st October, 1938, was taken from the Eudlo district on a medium slope of north-easterly aspect on a plantation set in December of the previous year on an 8 feet by 8 feet 6 inches system. The soil was hand dug to a depth of 10 inches before planting and again hand dug to about the same depth in the following July. The profile was dug almost half way between plants, running south-east to north-west at right angles to the slope, and the nearest stool was 38 inches high with a base approximately 18 inches in circumference. It will be seen that 102 roots were found, and of these less than 50 per cent. were within 10 inches of the surface. There are, of course, less roots shown here than in the previous diagrams, but it is to be noted that

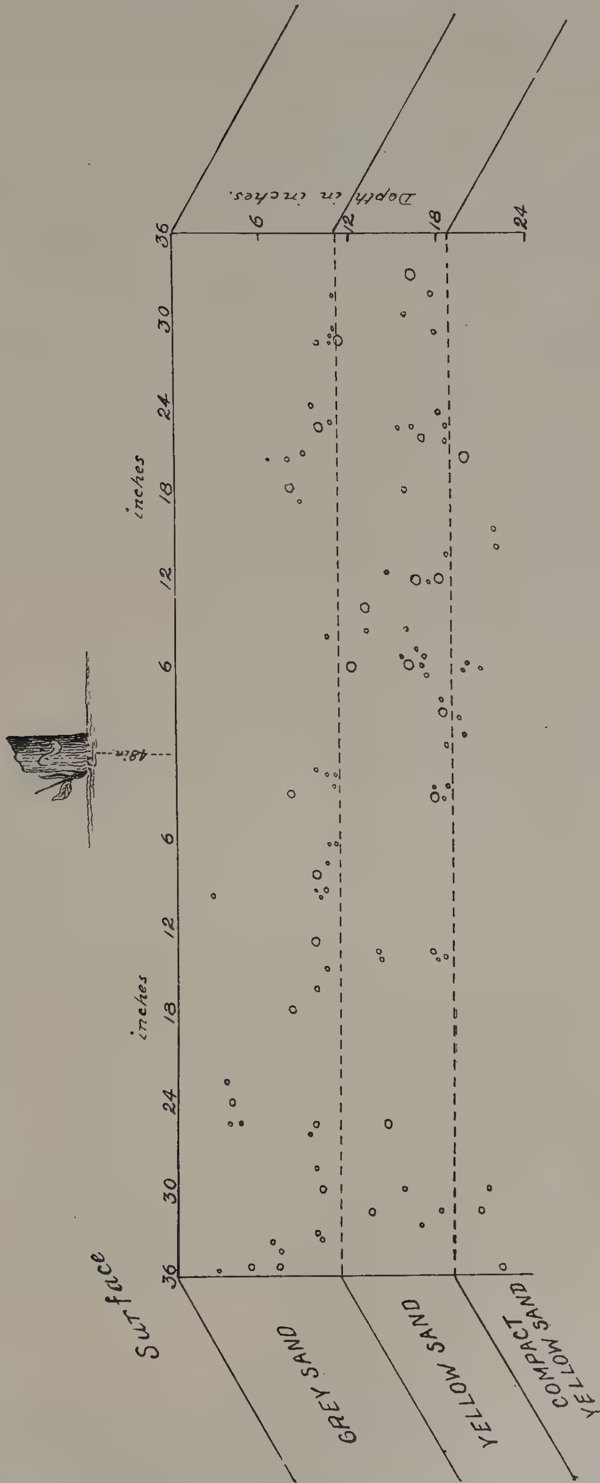

Surface
GREY SAND
YELLOW SAND
COMPACT YELLOW SAND
Depth in inches.
inches
inches
18in.
36
30
24
18
12
6
6
12
18
24
30
36
6
12
18
24

Plate 163.

this profile is 6 feet in length, whereas the previous two were 2 feet longer, so that the total number of roots compares quite well with that of the others. Relative root size is again shown as before.

Diagram 4.

This diagram (Plate 164) portrays the series of profiles prepared as outlined in the second method described under "Technique." This example is taken from a Woombye plantation set on a 9 feet by 9 feet basis on a slope of medium grade with a northerly aspect. The plant concerned was 44 inches high and had a basal circumference of 26 inches. The examination was made on the 12th September, 1938, approximately twelve months after planting.

The number of roots found at 12 inches from the plant base was twenty-seven, at 18 inches thirty-two, at 24 inches twenty-three, at 30 inches seventeen, at 36 inches eighteen, at 42 inches twenty-four, and at 48 inches twenty-six. The increase in numbers in the two most remote profiles mentioned over the two middle ones may be accounted for by branching, and perhaps to some extent by the intrusion of roots from the neighbouring plant; though this latter explanation is discounted by the fact that only seventeen were found at 54 inches. It must be remembered that the roots diverge somewhat, and this must be allowed for in making deductions from the data.

The small index figure beside the depth marking indicates the distance from the left-hand side of the profile, which was 9 inches wide.

On this diagram has been superimposed an attempt at reconstruction of the root system. This reconstruction was attempted after the information obtained from the plant shown in the plates and mapped in Diagram 6 was available. The main points kept in mind in this theoretical reconstruction were the general trend of roots as found by the third method described, the fact that root crossings are very rare, and the divergence generally at but a small angle, so that a root which appears at, say, 3 inches from the left side of the 12-inch profile would almost certainly not be represented at the 18-inch profile by any index above four or below two. The eighth highest reconstructed root may be taken as an example. At the point 12 inches from the plant this is found at between the 5 and 6 inches depth and 2 inches from the left-hand side of the profile. From what has been said of points to be observed, its continuance must be looked for at 1, 2, or 3 inches from the left-hand side and at round about the 6-inch depth. It has accordingly been visualised as the same root as appears at the 18-inch profile at the same distance from the left and at about the same depth. It could, of course, have been represented at this distance by one of those roots which appeared 1 inch from the left side of the profile and slightly deeper, but taking everything into consideration this is considered less probable. Continuing on, it is traced as dipping rather sharply between the 24-inch and the 30-inch profiles, and again between the 42-inch and 48-inch profiles. It thus corresponds roughly to the position marked for four roots in the third tier in Diagram 6.

Diagram 5.

This diagram (Plate 165) represents the same data as shown in Diagram 4 with each profile set down as a separate entity under the same system as was used in Diagrams 1, 2, and 3. This is rather more easily followed and, apart from this, serves to bring out the points

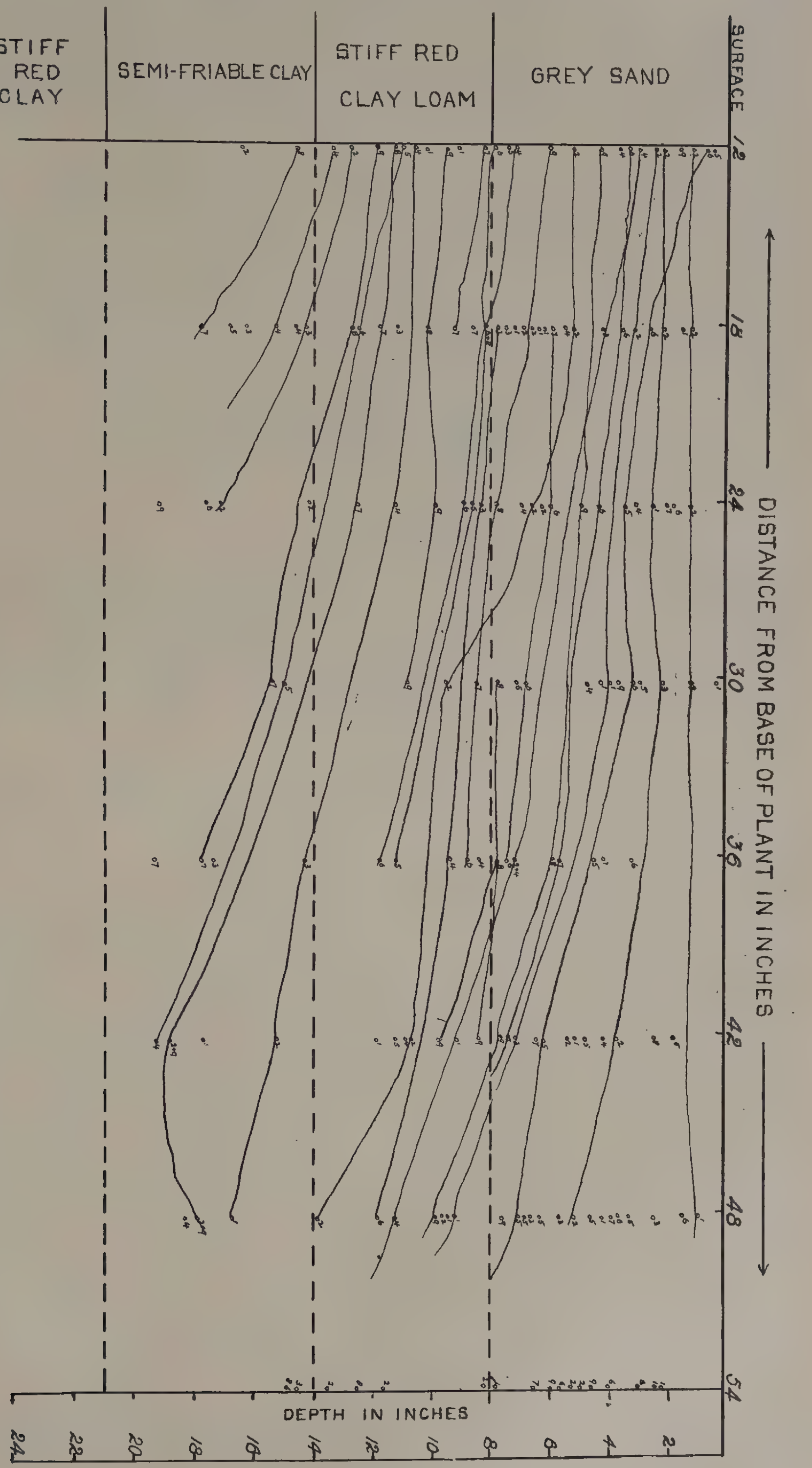

STIFF RED CLAY
SEMI-FRIABLE CLAY
STIFF RED CLAY LOAM
GREY SAND
SURFACE
12
18
24
30
36
42
48
54
DISTANCE FROM BASE OF PLANT IN INCHES
DEPTH IN INCHES
24
22
20
18
16
14
12
10
8
6
4
2

Plate 164.

which have just been mentioned as requiring to be observed when reconstruction is attempted. The same root as was instanced in the discussion in Diagram 4 has been marked with a cross to identify it in Diagram 5 and thus its position relative to the left side of the profile is clearly seen.

Diagram 6.

This diagram (Plate 166) requires very little explanation. It is merely a map of one-quarter of the root system of the plant grown under the controlled conditions described under the third method and which is shown in the photographs. It must be remembered that in this map on a plane surface are shown roots which occur in a volume of soil measuring roughly 24 inches square by 30 inches deep. The numbers marked indicate the number of roots which were found conforming to the general course indicated by the line below that number.

Description of Photographs.

These photographs are all explanatory of the third method of technique which has been described.

Photograph 1.

In the first photograph (Plate 167) is shown the plant in position in the box on the completion of its growth and just prior to the removal of the soil. The planting material used was a "bit" from the corm of a sucker about 3 feet high and weighed approximately 1 and 1½ lb. at the time of setting. As mentioned above, the plant was watered as required, but no fertilizer was applied.

Photograph 2.

The second photograph (Plate 168) shows the soil profile in the box immediately after the removal of one side. It may be noted that portion of the soil has adhered to the side of the box, particularly in the subsoil sections, where the clay content was rather high. A large number of loose ends of roots are to be seen, and their vertically downward growth is apparent. As, however, this vertically downward growth has taken place at the sides of the box and therefore under definitely unnatural conditions, these loose ends were subsequently cut off at the point of emergence from the soil. Although the conditions which caused the branching and this downward growth are certainly artificial, it may be that this gives a clue as to what happens when the banana roots come into contact with a large stone or similar obstruction in the soil. The depth of the soil was approximately 29 inches. The top soil to a depth of approximately 5 inches was a fairly heavy loam, the dark colour of which was due to the presence of a large amount of humus. This rested on a yellow, compact, loamy subsoil, the clay content of which imperceptibly increased with depth so that at about 2 feet it could be described more correctly as a somewhat friable clay.

Photograph 3.

The third photograph (Plate 169) gives a comprehensive view after the sides of the box had been removed and the soil washed away.

Photograph 4.

The fourth photograph (Plate 170) is one of the root system taken at the shortest practical range. The plant has fallen approximately

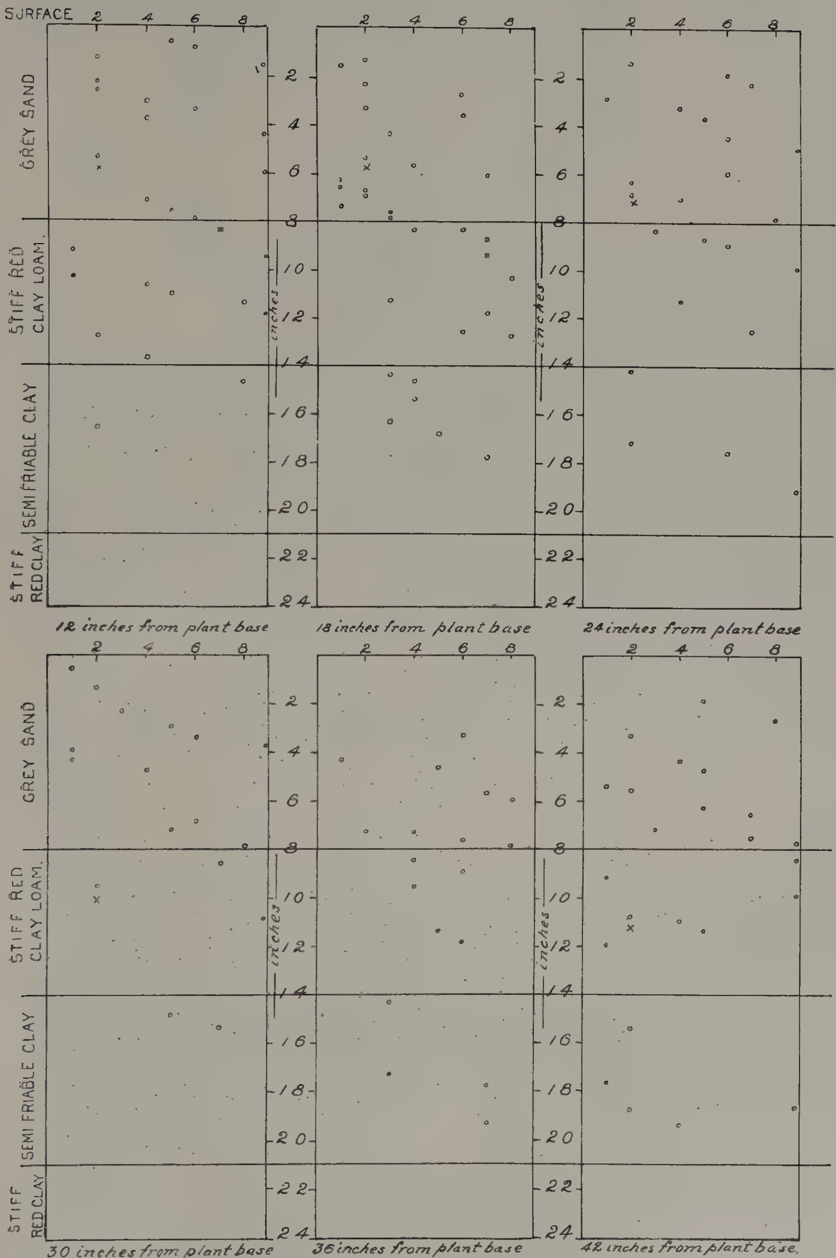

SURFACE
GREY SAND
STIFF RED CLAY LOAM.
SEMI FRIABLE CLAY
STIFF RED CLAY
inches
12 inches from plant base
18 inches from plant base
24 inches from plant base
30 inches from plant base
36 inches from plant base
42 inches from plant base.

Plate 165.

5 inches following the removal of the soil, and this has reduced somewhat the apparent angle of the roots to the stem. It will be noted that the rooting system may be described as forming something in the nature of a hollow cone. Though a number of roots which originate close to the surface of the soil radiate out gaining no great depth, it is to be

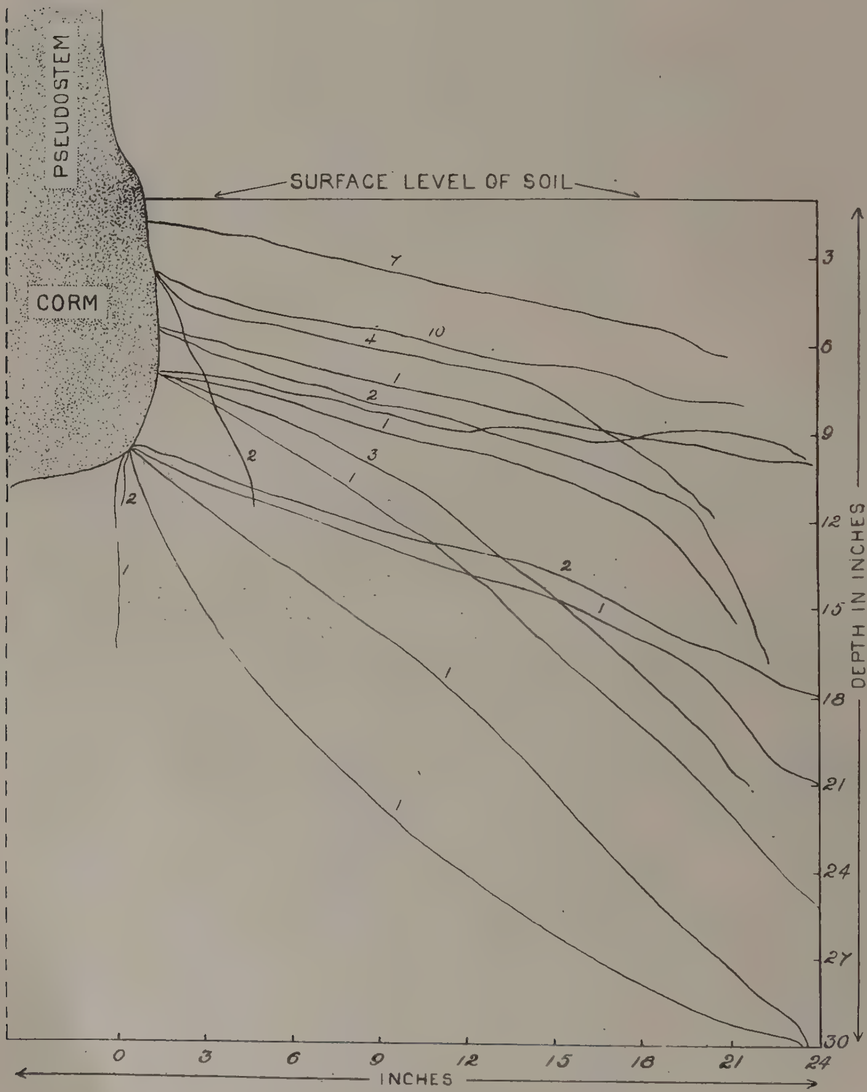


Plate 166.

noted that a large proportion of those roots which arise at a lower level on the corm penetrate the soil at a rather acute angle. This plant was, of course, only six months old and therefore by no means fully grown, so that apart from other considerations the actual length of the shorter roots may not mean a great deal. It will be seen, however, that

Plate 167.

Plate 168.

several roots have reached the bottom of the box or, in other words, almost 2 feet 6 inches below the surface into the clayey subsoil. The angle at which these roots grew was approximately 45 degrees. This is a good deal steeper than the average, but at the same time it may be said that the general tendency of all but the surface laterals was to penetrate the soil at an angle of between 60 and 70 degrees to the vertical.

It may be of interest to note that this plant at the time of being photographed was carrying more than 130 main roots; of these, forty-two would be classified as surface laterals. Very deep roots penetrating at an angle of less than 60 degrees to the vertical also numbered forty-two, whilst the remaining forty-six were found between those limits. Thus each of the three general categories into which the roots of this plant fall are of approximately the same numerical strength.

In order to grasp the full significance of this photograph, reference should be made to Diagram 6 (Plate 166).

DEDUCTIONS.

Whilst it is possible to make quite a number of theoretical deductions from the data given, it is felt that before arriving at and stating many definite conclusions it is essential to have a great deal more knowledge than is at present possessed, even though the data which have been presented in this article are but a small part of what has so far been obtained. It is quite impossible to publish all the results, and therefore a few representative diagrams only have been used. These have been chosen as being reasonably representative of the types of soil so far examined, and at the same time have been selected to show the points over a wide range of soils.

The only definite point which can be made is that the practice of fertilizing close to the base of the plant so commonly seen in this State has nothing to commend it. The profiles taken approximately half way between the rows on 9 feet by 9 feet plantings show prolific root occurrence in that region, and it is very evident that fertilizer could with profit be spread over the whole area, except that there is little to be said in favour of any of the material being placed very close to the corm. Whilst on this feature, it is to be noted that there is little branching of the roots within 2 feet of the plant and that by far the greatest density and numbers of the small feeder roots are towards the ends of the main roots, and that the number close to the plant under normal conditions is really surprisingly small for a plant of this type. It may be mentioned that at times there has been confusion between the hair roots, as the smaller subsidiary roots are termed, and the root hairs through which the food material is absorbed into the plant. The root hairs are of microscopic size and accordingly are not known to growers. They are to be found on banana roots of all sizes and are much more numerous along the main roots than might reasonably be expected.

Study of the diagrams and photographs shows that when the soil is of open texture and well aerated the roots will penetrate it to a considerable depth. Diagram 3 shows what is, perhaps, an approach towards the ideal root distribution in soils of the general type portrayed, for such roots would have access to a very large volume of soil, and at the same time it would be expected that the effects of drought would be less quickly and less intensely felt than if the roots were allowed or encouraged to remain near the surface.

Plate 169.

Plate 170.

Care must be taken in comparing any two soil types. For example, in the type of soil shown in Diagram 2, if deep cultivation were practised continually it would probably have disastrous effects, for either a large proportion of the roots would be cut frequently or they would be forced down into the uncongenial wet clay. It must be emphasised that this soil was not a badly drained one.

The correct cultivation of the soil portrayed in Diagram 1 is open to question, but, as basaltic loams of this type are apt to dry out very quickly, it seems at least possible that a very deep initial working would be beneficial.

However, it is not proposed to formulate any definite recommendations at this stage, other than to point out the necessity for each grower to learn as much about his soil formation as he is able. Until further work has been carried out it can only be suggested that, as the roots of the banana can be readily forced down, the grower should take steps to do this to as great an extent as his soil formation suggests is desirable.

ACKNOWLEDGMENT.

Much of the field work which has been done in connection with banana root distribution was, through the courtesy of the Director of Fruit Culture, carried out by the late Mr. E. L. Miles, and a tribute must be paid for the painstaking care which was a feature of this and all other work which Mr. Miles did in association with the writer.

A BUSH WHEELBARROW.

Select a fork of suitable size and shape, and saw it down the centre to give you the two sides of the frame. Trim the handgrips and bore two auger-holes for the crosspieces, which are wedged in position as when fitting a hammer handle. Two long bolts passing through from side to side make the frame firm and solid. Two blocks of wood are bolted on for the axle to run in, and a bitumen drum in one piece forms the body.

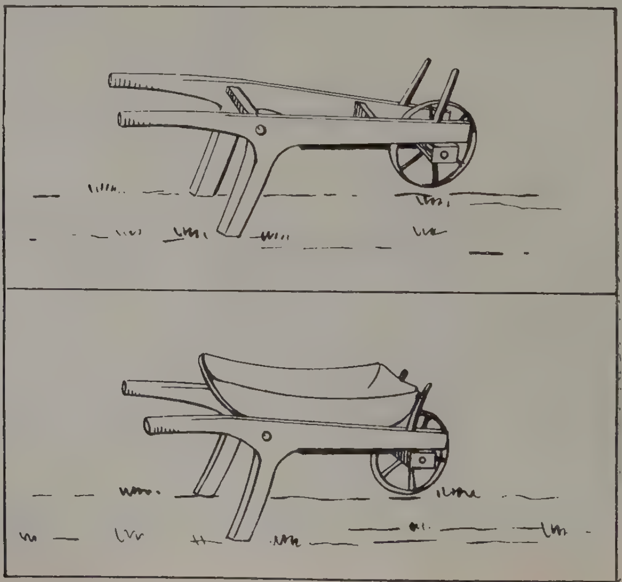


Plate 171.

Bean Fly Control in Southern Queensland.

N. E. H. CALDWELL, M.Sc.Agr., Assistant Research Officer.

THE bean fly* has been known as a pest of cultivated beans in Queensland since the early part of the present century and is almost certainly an indigenous insect which has transferred its attention from native hosts to cultivated varieties of beans. In the coastal areas, this pest has been largely responsible for the restriction of the bean-growing season to the cooler months of the year. Even then, however, serious losses have sometimes been experienced. Control measures have previously been unsatisfactory, but recent investigations in New South Wales and Queensland have improved matters considerably.

Description, Life History and Habits.

The adult is a very small black fly (Plate 172; fig. 5) which can be easily detected when resting when on the leaves of bean plants. The females lay minute colourless eggs through small punctures made in the upper surface of the leaf. These punctures (Plate 172; figs. 1 and 2) are usually concentrated near the base of the leaf and may be very numerous, but normally only a comparatively small number of them contain eggs. On hatching, the very small and almost colourless larvae tunnel through the leaf tissue to the leaf stalk. In young plants, the larvae (Plate 172; figs. 3, 6, and 8) travel thence into the main stem of the plant, where they become fully fed, and finally pupate at about ground level; in older plants, development may be completed in the leaf stalk and stalk joints. The pupal cases (Plate 172; fig. 4) containing pupae are about one-tenth of an inch in length and occur just beneath the surface of the stem. They are at first cream coloured but gradually turn brown with age.

The eggs hatch in two to four days in warm weather. The larvae take one to two days to mine through the leaf into the stalk and feed for another seven days in the leaf stalk and the stem before pupating. The flies emerge nine or ten days later. In cool weather development is much slower.

Seasonal Importance.

Probably at no period of the year are beans completely free from infestation. Normally, however, the pest is destructive only during the warmer months of the bean season. Both early crops, planted in January and February, and main season crops, planted in March, April, and May, may suffer, but attacks usually diminish towards the end of May and are of little importance in later sowings, except in a mild winter. In the absence of bean crops in spring, the fly population remains low until planting begins in January and February. Populations then build up rapidly as the acreage under crop increases, and mid-season crops are, therefore, most liable to severe bean-fly attack. If all the year round planting is attempted, early crops may suffer just as severely as those planted in mid-season.

Injury to the Plant.

The first symptom of acute bean-fly infestation in young plants is a characteristic drooping of the first two leaves. Death frequently follows, but if the plants survive, the stems burst at or just above ground level, where the larvae and pupae are concentrated, and large rusty-red calloused areas develop. Such plants may remain unthrifty or they

* *Agromyza phaseoli* Coq.

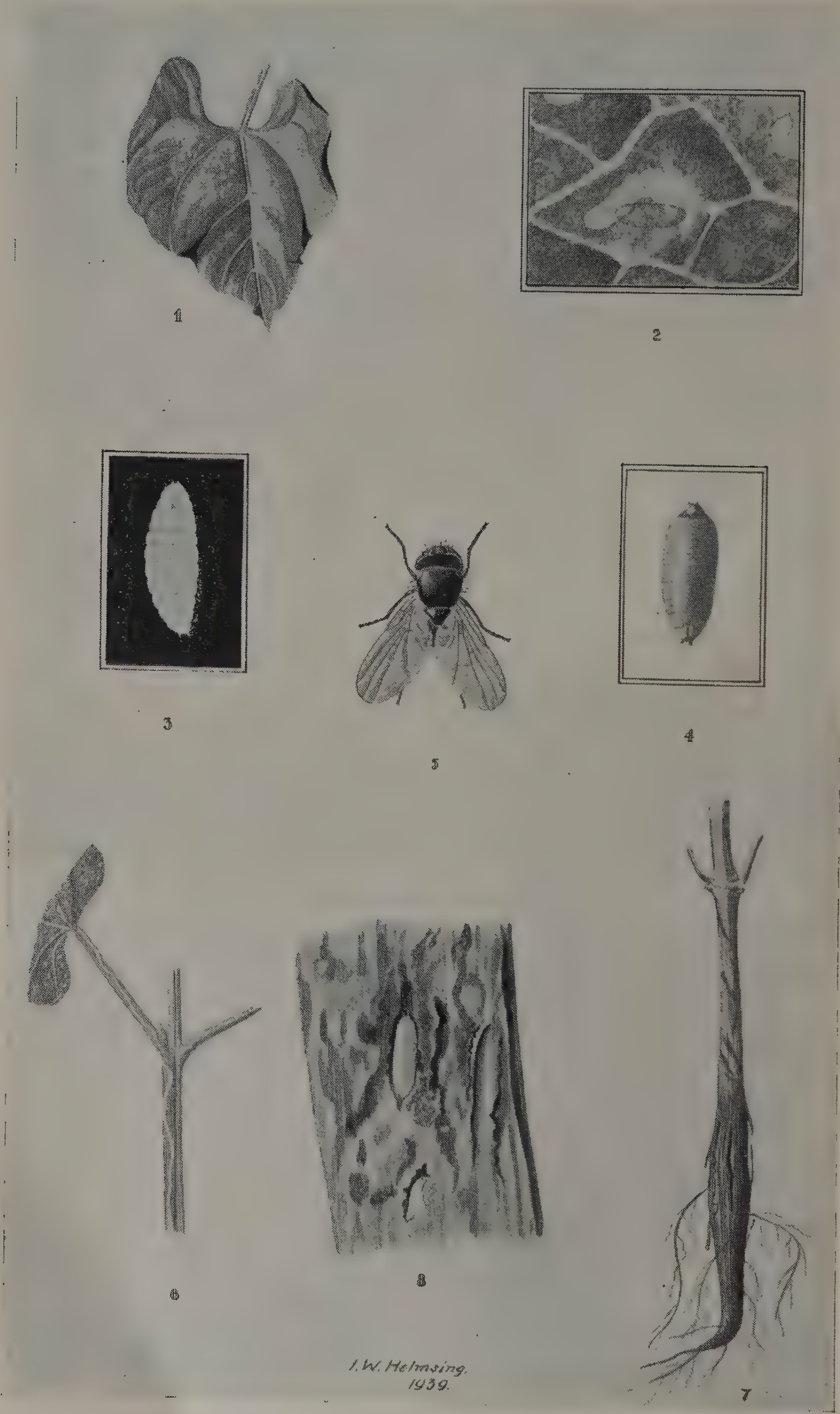


Plate 172.
Bean Fly.

may, if growing conditions are good, develop secondary roots at or above the calloused region of the stems and partially recover to bear a crop. If the attack is slight, the plants may not show any external symptoms, but the fly pupae can be exposed by peeling away the surface tissue of the stems.

In older plants, infestation is usually accompanied by a discoloured swelling at the leaf joints. This appears to have little effect on cropping capacity, but undoubtedly predisposes the plants to wind damage and to breakage during picking operations.

Control Measures.

Spray Formulae.—Satisfactory control can be achieved by the use of a spray consisting of 1 part of nicotine sulphate, 8 parts of white oil, and 800 parts of water. Convenient formulae are as follows:—

	(1)	(2)
Nicotine sulphate	1 fl. oz.	¼ pint
White oil	8 fl. oz.	2 pints
Water	5 gal.	25 gallons

Spray Schedule.—The spray should be applied three days after beans first appear above ground and thereafter at intervals of four days.

The number of applications will depend on the time of the year and the prevalence of the fly. In 1938 two sprayings gave good protection to beans planted in mid-April. In 1939 four sprayings were necessary for late February and two for late March plantings. Four to six sprayings are usually required for mid and late summer, and two to four for autumn and early winter plantings. Owing to the variation in fly attack from year to year the precise number of spray applications needed for any particular planting must be decided by the grower after taking into account the following factors:—

(*a*) The actual prevalence of adult flies on the crop. If flies are obviously abundant, a greater number of spray applications is indicated.

(*b*) The incidence of damage elsewhere in the district. If losses are common on adjacent properties, it would be sound policy, even though the flies are not actually abundant on the grower's own crop, to use a greater number of sprays than indicated by (*a*).

(*c*) The rate at which the crop is growing. Slow growing plants require more spray protection than those in a rapidly growing crop.

Spraying Method and Quantity of Spray Necessary.—Only the top surface of the leaves need be thoroughly sprayed. A double nozzle should be fitted to the ordinary knapsack pump. The single nozzle may use less spray but thorough treatment is difficult and single nozzle treat-

DESCRIPTION OF PLATE 172.

BEAN FLY.

Fig. 1. Leaf with egg-laying punctures, ½ natural size. Fig. 2. Egg inside leaf tissue x 20. Fig. 3. Larva x 10. Fig. 4. Pupal case x 10. Fig. 5. Adult fly x 10. Fig. 6. Portion of plant showing larval path from leaf to stem, ½ natural size. Fig. 7. Stem with injury at ground level, ½ natural size. Fig. 8. Stem cut open to show larvæ in injured tissues x 5.

ments frequently result in inefficient application and thus unsatisfactory control. The quantity of spray necessary will vary from 30 to 50 gallons per acre, depending on the planting distance.

Action of Spray.—The spray kills the eggs and young larvae in the leaf, but once in the leaf stalk or plant stem, the larvae are unaffected. The spray residue on the leaves repels the flies for at least twenty-four hours after treatment, and eggs laid in leaves within forty-eight hours after spraying may not hatch normally. Each treatment thus protects the crop only for a short period, but when the spray schedule is completed, the plants are much less susceptible to damage. They have also become less attractive to the adult flies than younger plants. Because of this the current practice among growers of planting small areas at about fortnightly intervals throughout the main season diverts the insect to the younger crops, which are, in turn, protected by sprays.

Spraying Precautions.—The spray formula devised after careful trials in New South Wales and checked in Queensland should not be varied in any way. Slight burning of the leaves may occur but is of no importance. Increasing the concentration of the spray ingredients, however, introduces a definite risk of serious plant injury. On the other hand a reduction in the amount of oil, for instance, considerably reduces the repellant action of the spray residue against adult flies.

The interval between sprays is based on a thorough study of the insect's life history and should also be followed as closely as possible.

Rain soon after spraying may considerably reduce the kill of eggs and larvae, but once the spray has dried on the leaves its efficiency in this respect is not seriously affected. An extra spraying may, therefore, be well worth while if rain falls very shortly after a previous application. Continuous rain over several days—a not uncommon occurrence—will, of course, render spraying impracticable, but under such conditions bean-fly activity is somewhat lessened and the ill effects of any such interference with the spraying schedule are less than might be expected.

Fresh spray should be prepared for each day's application as the mixture deteriorates very rapidly if held in open containers for any length of time.

Cost of Spraying.—The cost of the spray materials should not exceed six shillings per acre per spraying. Labour costs will vary with the type of country on which the crop is growing, but under average conditions one man should be able to spray at least 2 acres per day, provided spray mixing is well organised.

Important Cultural Considerations.—Vigorous, rapidly growing beans are much better able to withstand fly attack than slow growing plants. Proper cultural methods are, therefore, an important aid in bean-fly control.

The effects of bean-fly attacks are frequently more marked in a dry season when growth is retarded. Thus, although none of the common varieties possess any actual immunity from attack, those which are hardy and least affected by adverse growing conditions are best fitted to escape serious damage.

Hilling up the plants encourages the growth of roots from the stems and is, therefore, an essential cultural measure. It is particularly important in infested crops, for the secondary roots which then grow at or above the region of serious stem damage compensate for the original roots, which have more or less ceased to function.

Yellow Daisy (*Wedelia asperrima*)—A Plant Toxic to Sheep.

C. R. MULHEARN, B.V.Sc.

IN the autumn of 1934 Maunder and Francis, of the Queensland Department of Agriculture and Stock, carried out a series of investigations into mortalities amongst rams, which had recently arrived in North-western Queensland from New South Wales. They ascertained that 194 deaths occurred amongst 415 rams on several different properties within a fortnight of being untrucked, and they were of the opinion that the cause was dietetic. The Yellow Daisy (*Wedelia asperrima*), amongst other plants, came under suspicion.

Serious mortalities amongst rams and other sheep, either whilst or shortly after being travelled, have occurred every year since. A history of the animals having had access to the Yellow Daisy a short time before death was frequently recorded from these cases. In one of the most recent mortalities 300 deaths occurred in a mob of 4,000 sheep over a period of a few days. This mortality was investigated by Mr. D. C. Clifford, Inspector of Stock at Julia Creek, who reported: "The feed was light where the sheep entered the paddock, little else but Yellow Daisy growing. When affected sheep went down froth and blood-stained mucous issued from the mouth. The rumen contained much daisy and daisy seed." In a second mortality investigated by Mr. Clifford this year, over 300 sheep died overnight following feeding "on a heavy stand of Flinders Grass with a fair proportion of *Wedelia asperrima* mixed with it." The owner who conducted postmortem examination reported that he noticed little except that the abdominal cavity contained a large amount of fluid the colour of virus.

Description of the Plant.

The Yellow Daisy (*Wedelia asperrima*) grows over a wide area of country in North Queensland extending from the Hughenden to the Cloncurry district. The plant is an annual, and appears each year shortly after the onset of the wet season. It grows to a height of about 18 inches, and is rough to touch, due to a clothing of short stiff hairs. The leaves are opposite and usually toothed on the edges, and are about 2 inches long. The flowers are yellow and somewhat like those of a small sunflower. After the flowers mature seed-heads containing blackish brown fusiform seeds, about one-eighth of an inch long, remain. The flowers usually appear in the autumn, and it is in the autumn and early winter that mortalities in the field occur.

Field Mortalities.

Under normal circumstances the plant would appear to be very unpalatable to stock, for not only have attempts to induce animals to take it voluntarily failed, but reports also indicate that it is seldom if ever, eaten in its natural state by sheep which have been bred on country over which it grows. Most of the mortalities which are considered to have been caused by this plant have occurred in travelling stock, or in stock which have been moved from their usual habitat and placed in a new environment.

Plate 173.
Yellow Daisy (Wedelia asperrima).

A large percentage of the mortalities have occurred in rams, but this does not suggest that rams are more susceptible than other sheep. Rather it is due to the fact that the rams were recently introduced into a district where the plant was growing. Serious mortalities have also occurred amongst mixed travelling sheep when taken on to pastures containing a fair proportion of the plant. There are no recorded mortalities in bovines, but this may be explained by the fact that bovines are rarely introduced on to country containing an abundance of the plant.

Feeding Experiments.

A quantity of Yellow Daisy for the purposes of carrying out feeding experiments was obtained from the Julia Creek district and was identified by the Government Botanist as *Wedelia asperrima.* The plant was full-grown and contained flowers and seed-heads, but only a small quantity of foliage. It was chaffed, and offered to sheep in the earlier feeding experiments, but was consistently refused by three different animals either when given alone or with mixtures with other foodstuffs. Force feeding was then carried out, using the chaffed upper portion of the plant containing seeds, leaves, and fine stems. One sheep died eighteen hours after receiving $3\frac{1}{2}$ ounces of the plant, and a goat was found dead on the morning of the third day after receiving 4 ounces on the first day and 5 ounces on the second day. Three sheep also died in each case in less than twenty-four hours as a result of receiving extracts made by steeping from one-quarter to one-half pound of the chaffed plant in water for from twelve to twenty-four hours.

Symptoms.

The symptoms following forced feeding in all experimental animals were very acute, death taking place in the case of four sheep in less than twenty-four hours, and in from thirty-six to forty-eight hours in the case of the goat. This agrees with findings in the field where death frequently occurs within twenty-four hours of the animals being turned on to the plant. The period from the first sign of symptoms until death was also short and varied from four to not more than twelve hours. The first symptom detected was one of general malaise, the animal standing with drooped head and ears and making little or no attempt to move on being approached. This was followed by quivering and spasms of the muscles, giving the animal a stiff-legged appearance. Later the animal went down and exhibited marked muscular spasms as evidenced by uncontrolled leg movements and champing of the jaws. Respiratory distress was also noticed. About half-an-hour after going down death occurred. A quantity of blood-stained fluid issued from the nose a short time after death.

Postmortem Findings.

Postmortem examination revealed a severe inflammation of the abomasum or fourth stomach, and the first portion of the small intestine, but no other abnormalities were detected in the abdominal organs. A quantity of straw-coloured fluid containing jelly-like clots was present in the abdominal cavity. The amounts of fluid varied from a few ounces to half-a-pint in the different animals. A similar type of fluid was frequently found in the chest cavity.

Varying degrees of congestion of the lungs were present in the different animals. In some cases this feature was quite marked, whilst in others it was not so noticeable. In some of the animals the trachea

or windpipe contained a quantity of frothy or blood-stained fluid, and there was marked congestion of the lining membranes of this organ.

Discussion.

Symptoms and postmortem findings from mortalities in the field suspected as being due to *Wedelia asperrima* closely resemble those from feeding experiments, and as comparatively large amounts of the plant have been found in the rumen of dead sheep there is every indication that it has been responsible for these mortalities.

It is interesting to note that *Verbesina encelioides,* a plant closely related to *Wedelia asperrima,* was found to be toxic to sheep in New South Wales, and that the principal postmortem findings closely resembled those following death due to the ingestion of *Wedelia asperrima.*

Preventive Measures.

As the sickness following the ingestion of yellow daisy comes on very quickly, and as only a short time elapses between the onset of symptoms and death, little can be carried out in the way of treatment of affected animals. However, should an outbreak of poisoning due to this plant be encountered, all sheep that will travel should be moved to fresh pastures where the plant will not be available. Any sick animals should be moved to a shady paddock where they will be handy to water.

Special care should be taken with travelling sheep in districts where the plant may be encountered, and such sheep should not be allowed to feed over areas where the plant is growing. However, if this cannot be avoided the sheep should be allowed a good feed before they are taken on to the country, and they should be hurried over areas where the plant is abundant.

Rams which have been introduced from outside districts should be held in selected paddocks free of this plant as long as possible, or at least until they become accustomed to the new conditions.

AN IMPROVED WIRE GATE.

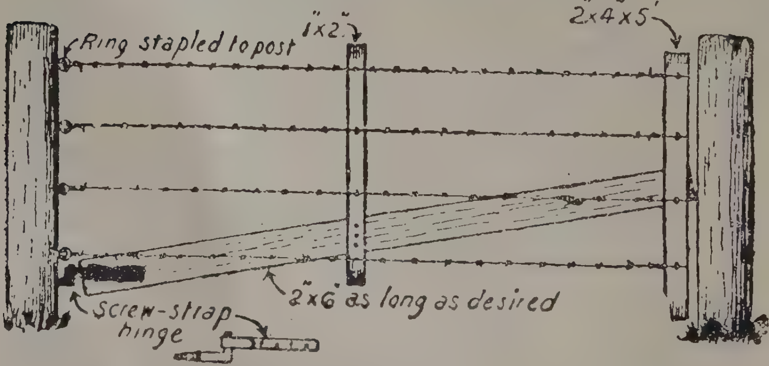


Plate 174.

AN IMPROVEMENT ON THE ORDINARY "CONCERTINA" TYPE OF WIRE GATE.

Fodder Conservation on Condamine Plains.

CONDAMINE Plains, the property of Mr. A. C. V. Bligh, form part of one of the oldest established holdings on the Darling Downs, with a history extending back to the earliest days of settlement in Queensland.

The plains are typical Darling Downs country—heavy, black soil land of extraordinary fertility. Up to about a quarter of a century ago, the Condamine country was used chiefly for wool and beef production. Since then an extensive acreage has been brought under the plough. Adjoining Condamine Plains are Melrose, Bostock's, and Kurrowah properties, all belonging to the Bligh family.

Plate 175.

Excavating a Trench Silo.—Several trenches like this—about 60 feet long, 12 feet wide, and 9 feet deep—were dug on Condamine Plains, each providing two days' work for four men with two tractors, a plough and a scoop, and with an estimated capacity of from 100 to 120 tons of sorghum.

Mr. Bligh has 3,300 acres under cultivation, mostly cropped for wheat. Sorghums, lucerne, rape, oats and introduced pasture plants also are grown on a comparatively large scale for fattening beef cattle and sheep, as well as for lamb raising.

Recently, as an addition to the regular cropping system, an extensive fodder production and conservation project was initiated. For conservation, several varieties of sorghum were selected as providing the most conveniently handled material. Altogether 370 acres were planted in one block, and 240 acres in another.

Plate 176.

A CROP OF SORGHUM ON CONDAMINE PLAINS.—Note height and density of growth.

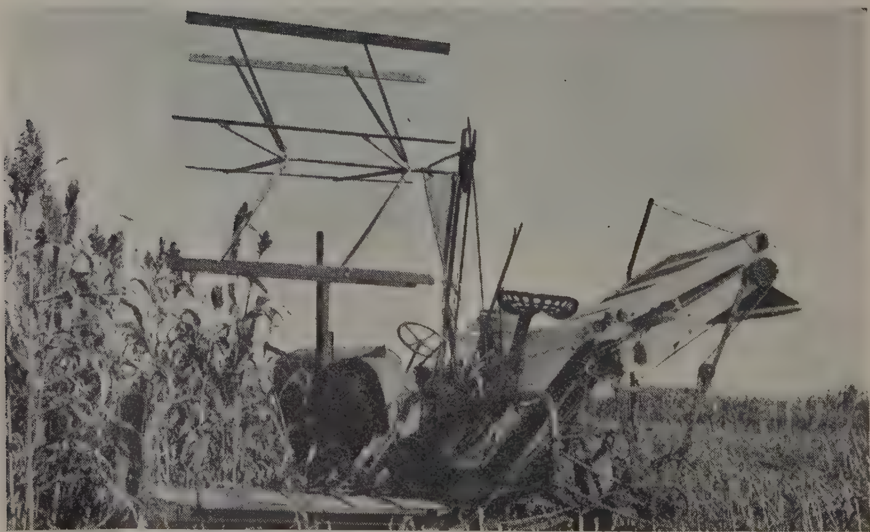


Plate 177.

THE REAPING MACHINE.—Contrived from an ordinary reaper-binder, this outfit proved very effective in the field (see page 405).

The past season was an excellent one for the growing of sorghum, and some extraordinarily heavy crops were produced on Condamine Flats.

On the Darling Downs, grain sorghums are being substituted largely for maize, which in seasons of uncertain rainfall often fails as a grain crop, because of its moisture requirements at two critical stages of growth—tasselling and cobbing time. If soil moisture reserves are low, sufficient rain immediately before and after tasselling is of vital importance to the production of a satisfactory maize yield.

Plate 178.

A Close-up of the Extension Elevator on the Converted Reaper-Binder (see page 405).

The sorghums, on the other hand, are much hardier, and rain is not required so urgently at particular stages of crop development. Another point in their favour on the Downs where mint weed has become a pest, is their adaptability to sowing with a standard wheat drill, thereby checking or smothering all weed growth. Maize rows may be kept clean by cultivation, but the spaces between stalks become overgrown with mint weed, which absorbs considerable moisture to the detriment of the maize crop.

The feeding of sheep on sorghum also is adding to its popularity as a fodder crop, for the large quantity of feed it provides increases the carrying capacity of the grazed area. It is claimed for sorghum, too, that sheep do remarkably well on it.

For ensilage making, the sorghums are excellent; and, apart from their nutritive properties, they produce heavy tonnages to the acre.

The harvesting of sorghums for stacking, pitting, or trenching is becoming an established practice with stockowners on the Downs, and, in this respect, Mr. Bligh and other landholders have given a commendable lead.

Plate 179.

THE REAPER IN ACTION.—Power for operating the converted reaper-binder is supplied by the tractor by an ingenious transmission device. The cut is delivered on to the lorry by an extended elevator. (See description on page 405.)

The reaper-binder was altered in an ingenious way for cutting, lifting, and delivering the fodder. The principal alterations were the removal of the knotter and its replacement with a pair of canvas rollers, and the raising of the reel to deal with a tall crop.

Plate 180.

A CLOSER VIEW.—The lorry is attached to the reaper and the motive power is supplied entirely by the tractor.

The 10-20 tractor, with a power take-off to the reaper-binder, besides supplying the draught power, provides the energy for cutting the sorghum and lifting it on to the lorry alongside the machine, and on which a hurdle had been fitted on the off side. Across the lorry table top flexible wire ropes are laid to facilitate unloading the fodder into the trench.

To synchronise the cutting, elevating, and loading, the engine of the lorry is switched off as soon as it is drawn alongside the reaper-binder, and a towing chain passed from the scraper bar of the engine to a back shackle of the lorry spring.

As soon as one lorry is loaded, another takes its place; the first proceeds under its own power to the point of delivery at the trench side. By keeping this sequence, a load—about a ton in weight—is trenched every 15 minutes.

This year, sorghum on Condamine Plains made extraordinary growth. A stand of more than ten feet high was obtained; consequently, it became obvious that the crop would be very difficult to harvest if it were to be cut for ensilage, as the use of the ordinary binder was out of the question. The difficulty, however, was overcome ingeniously by Mr. J. Eggleston, who is in charge of the farm operations on Condamine Plains, and who contrived a machine, with an ordinary reaper-binder as the chief part, to harvest the crop cheaply and, except for the height of the cut, very efficiently.

Plate 181.

Delivering the Cut Sorghum at the Trench Side.—To pull the load into the pit, the cables laid across the floor of the lorry before the load is placed on it are passed over the top of it and attached to a tractor. (See Plate 182).

From the original reaper-binder, Mr. Eggleston removed the whole of the binding gear. Above the ordinary canvas elevator an extension elevator was placed, which works with a pair of ordinary binder canvases. The beater reel was heightened and the main frame extended, so that crop stalks as long as seven or eight feet could be harvested without difficulty. But even with this extension, it was found that a large proportion of the Condamine Plains crop was too high for the machine, so the cutting knife had to be lifted from the ground as far as practicable. The wheel drive of the original reaper-binder was removed. For operating the improved machine, power is supplied from a tractor by an ingenious transmission device. The tractor also pulls a lorry attached to and alongside the reaper, the pull being by a chain from the tractor scraper bar, through a D, to the offside back spring shackle. The lorry engine is de-clutched and the motive power supplied entirely by the tractor, so that the lorry must keep its position in line with the elevator on the reaper. One man steers the lorry from the side near the tractor to keep it running in its correct alignment. Another drives the tractor, and two other men remain on the lorry to receive and place the sorghum stalks delivered from the extension elevator. To the lorry top, or floor, a 2 ft. extension has been fitted on the side further from the reaper, and on this an inclined batten frame has been built.

Plate 182.
TRACTOR READY TO PULL THE LOAD FROM THE LORRY.

By this contrivance, the lorry is loaded with a ton of sorghum in 15 minutes, and is then driven to the silage trench, its place being taken by a second lorry similarly equipped.

The trench silo is filled from both sides alternately. To off load, two light flexible steel cables are laid across the floor of the lorry before it is loaded. When the load is to be dumped into the pit, the cables are passed over the top of it across the trench and fastened to a tractor, which, with a movement of a few yards, pulls the whole load into the excavation. The cables are then disconnected and the lorry returns to the reaper for its next load. The operation is repeated with the second lorry, and thus the reaper keeps two going continuously. Odd stalks out of position are raked by the driver of the trench-side tractor, who has a

Plate 183.
DUMPING THE LOAD.

few minutes between loads to do this. As each layer of sorghum is laid the length of the trench the tractors are run over the sorghum to pack it down tightly.

The trenches—about 60 feet long, 12 feet wide, and 9 feet deep—were excavated in two days by four men with two tractors, a plough, and a scoop. One tractor was used for ploughing, and the other for pulling the scoop. The spoil was conveniently placed for use in forming a mound on top of the sorghum "filling" on completion of the job. It is estimated

Plate 184.

A Partly-filled Trench.—The tractors traversing the trench to consolidate the dumped sorghum.

that each trench contains from 100 to 120 tons of ensilage. Scoops were used again to cover the filled trench with soil, the earth being hilled at each end of the trench and then pulled over its whole length with a small scraper scoop attached to a long cable from a tractor. When filled and covered, a mound 6 to 7 feet high was formed on top of the trench, covering rather more than its full length, but as both ensiling material and soil settled the height of the mound was considerably reduced.

The sorghum crop on Condamine Plains was planted late in January, and it was considered the best crop of its kind ever grown on the property. It averaged at least 20 tons to the acre—10,000 tons of excellent fodder from 500 acres. At maturity the crop was very sweet and juicy, with heavy seedheads well filled. It was impracticable to conserve more than a very small proportion of the crop as ensilage, and the great bulk of it is being used for feeding and fattening stock in the paddock.

Plate 185.
The Trench Nearly Filled.—The ''packing'' process continued.

Plate 186.
A Few More Loads to Top Off.

Plate 187.

The Job Finished.—After filling the trench, soil—spoil from the excavation—was scooped over the sorghum stalks to a considerable height, completely excluding air from the ensiled material. The man standing on the top of the bank is 6 feet tall. The mound of soil, high enough to allow for subsidence, is cambered and banked well beyond the edge of the excavation.

Plate 188.

A Mob of Forward Feeders on Condamine Plains.—These cattle were topped off on sorghum, other fodder crops, and improved pastures, and were sold on the property as fat stock, at a highly satisfactory price.

The harvesting plant employed, especially the ingenious reaper-binder adaptation, proved to be remarkably economical in its operation, as well as a great saver of time and labour. The actual cost of trenching the sorghum worked out at 4s. 8d. a ton.

Stock-fattening on the Darling Downs.

The fattening qualities of sorghums—saccaline, feterita, and wheatland milo—were demonstrated last year in the Pittsworth district. On 80 acres of crop, 1,100 sheep were grazed for five months, and they fattened during that period.

Southdown-merino crossbred lambs, sold in drafts five weeks and later after weaning, realised 24s. 6d. a head.

So far, two drafts of fat cattle which had been running on sorghum and green crops throughout the winter have been turned off Condamine Plains. The cattle, when turned on in May, were in poor condition. Despite an abnormally wet winter and the consequent deterioration of much of the sorghum, they topped up well and brought good prices—around £10 a head—when sold on the property. The sorghum was fed off by subdividing the paddocks with an electric fence, and afterwards the cattle were moved to a bigger area to graze on the broken-down sorghum crop, with access also to green feed. The 500 tons of trench silage made from the sorghum remains untouched.

It is considered that the system of cattle-fattening now practised on Condamine Plains has a definite future and its general adoption on a large scale is practicable, particularly at the present time of necessity for increasing beef production. The extension of cattle-fattening on the Darling Downs, however, will depend a good deal on the establishment of a store cattle market at some convenient centre, where fatteners in a small way could obtain stock in numbers in accordance with the carrying capacity of their holdings. Such a market would be of advantage to breeders as well, for they would be able to produce more stock for sale to graziers specialising as fatteners.

PRICE INSURANCE FOR FARM PRODUCTS.

Here is a new idea—or an old idea with a new application. In the course of the current campaign for placing agriculture in Britain on a firmer foundation, the British Government has decided to provide further assistance to the land industries by applying the principle of price insurance to sheep, barley, and oats.

The British Government's "new deal" is not intended to guarantee a profit to farmers; it is designed to insure farmers against what is termed "substantial loss," to improve and maintain the fertility of the soil, and to obtain an all-round improvement in the economic position of the industry. In defining the principle of price insurance, it was made clear that it is not a "guaranteed price," which would mean, obviously, that if a guaranteed price were granted, farmers would enjoy a degree of security which Parliament has not given to any branch of industry.

On the other hand, "price insurance" means that, at the worst, the prices a farmer would receive will not be allowed to fall so far as to involve him in a substantial loss on the working of his enterprise as a whole. Also, by it the fear that an unforseen drop in price of one commodity may eat up all the profits of the farm would be removed from the farmer's mind. Price insurance would enable him to look ahead and plan his production in such a way as to accord with the real needs of his land and maintain its fertility and productivity. That is the real insurance which agriculture needs, and it will be interesting to watch this new plan to see how it works out in actual practice in Great Britain.

Fruit Packing Instruction.

J. H. GREGORY, Instructor in Fruit Packing.

NUTRITIONAL knowledge emphasises the necessity of correct diet. The chief essentials for a correct diet are fruit and vegetables. To win popular favour, fruit should be presented for sale in the best of condition. Most fruits marketed in Australian cities have to be conveyed long distances. To avoid damage in transit, right packing methods have to be adopted by producers. To assist them in producing good packs, the Department of Agriculture gives free packing tuition to all growers who apply for it. In addition, the Department, in conjunction with the Department of Public Instruction, conducts classes for school children in most Queensland citrus-growing districts, in the South Coast banana-growing districts, the Stanthorpe deciduous fruit district, and the tomato-growing areas near Brisbane. Instruction in packing other fruits is given as required.

Lessons to children cover the theory and practice of marketing. Pupils 12 years and over receive instruction, which may be spread over two years. While not being experts at the end of their period of tuition, the children are able to master the principles underlying modern methods of packing, which may be afterwards applied with good effect in practice.

The first lesson of the series consists of an explanation of how and why it is necessary to pack fruit correctly. This is followed by visits to some nearby farm, where the children are shown how to pack consignments of fruit for market.

Many growers show a fine spirit of co-operation by providing fruit as well as facilities for the use of the classes. On some occasions, over 30 cases of fruit have been packed during a lesson, and in the ten years of continuance of these packing classes no complaint has been received as to the condition of the fruit on arrival at the market.

The real benefit of this tuition to the children can be consolidated by parents encouraging them to pack at home. At the same time, it is advisable that they should not be allowed to acquire speed in packing at the expense of efficiency. Experience in packing correctly at all times is the chief desideratum in home packing. By guiding the young people in this way at the beginning, doing the correct thing will become customary at all times.

The work of the fruit packing section of the Department covers a wide range. Investigation into storage and transit of all fruits, type of cases, efficiency of packing materials, design of case labels, and investigation into and advice on all marketing problems is obtainable free by growers on application to the Under Secretary, Department of Agriculture and Stock, William street, Brisbane.

The assistance given by the Department of Public Instruction, the Sub-Department of Forestry, school teachers, individual growers, and the Committee of Direction of Fruit Marketing in the work of improving the methods of marketing Queensland fruits is evidence of the truly co-operative spirit which animates all concerned in an excellent service to the fruit industry, and, therefore, to the State.

Plate 189.

BANANA PACKING INSTRUCTION, TALLEBUDGERA STATE SCHOOL.—Removing the "hands" from a bunch of bananas.

Plate 190.

"DEHANDING" AT THE INGLESIDE STATE SCHOOL.—Showing the correct angle to hold the dehanding knife to avoid damage to the bananas underneath.

Plate 191.

Applying Principle in Practice.—The children at the Beeches State School practice removing correctly the ''fingers'' from the hand to avoid wrenching the shank and so causing black end.

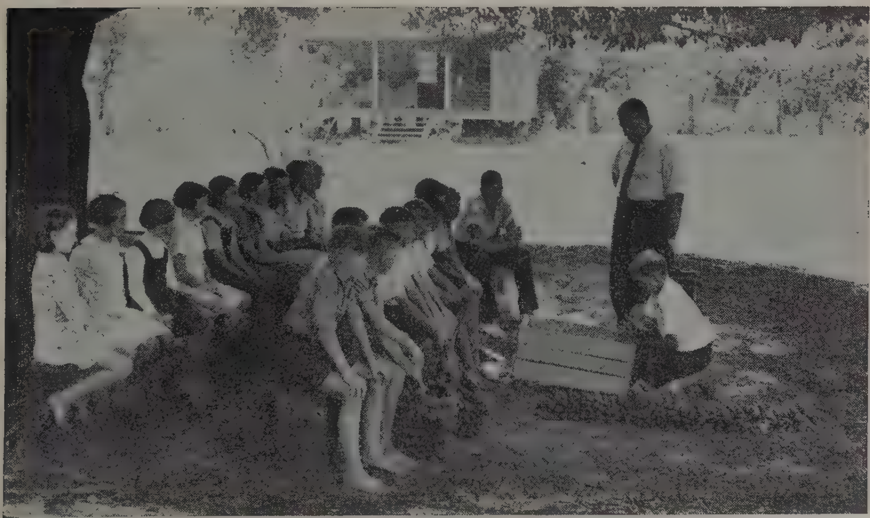


Plate 192.

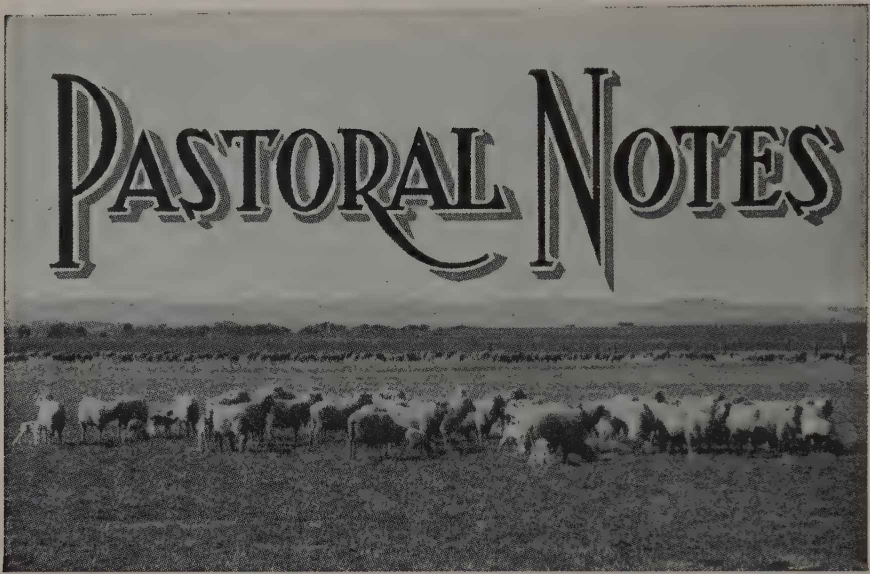
Packing the Fruit.—Note how the weight of the hand is supported on the forearm of the packer.

Plate 193.
AN INTERESTED CLASS AT UPPER CURRUMBIN.

Plate 194.
THE FINISHED CASE.—The work of the fruit packing class at the State School, Currumbin.

Plate 195.
Woombye Scholars Hard at Work.

Plate 196.
At the End of the Lesson.—The citrus fruit packing class at Montville State School.



The Effect of Seasonal Conditions on Sheep Parasites.

SEASONAL conditions must be taken into consideration when attempting to protect sheep against likely losses from blowfly strike.

If spring rains occur, resultant warm, moist conditions may be conducive to a big increase in flies. Fresh green vegetation, springing up after rain, is likely to cause scouring in flocks in localities in which those conditions prevail. Graziers who benefit by spring rains may, therefore, expect trouble amongst their sheep with wool sufficiently long and, probably, dirty.

To treat the odd sheep in a flock is only putting off the evil day, and much greater benefit will follow the effective treatment of the whole mob. Shearing is a great protection, but as this is only an annual job, the long interval between shearings must be considered. In places where dipping for lice and ticks is necessary, it has—if a good arsenical mixture is used—a most protective effect on the sheep, besides killing many of the flies. Dipping, from this point of view, is most satisfactory when the sheep are carrying at least six weeks' growth of wool. Crutching is a sanitary and useful method likely to give some protection against fly strike, but, as it does not kill the pest, the protection will be of short duration in a bad fly season.

Jetting with a regulation ·8 per cent. arsenical mixture will not only protect the sheep from maggots, but also will destroy large numbers of flies which suck the poisonous moisture from the wool. Because of the strength of the mixture, the wool surrounding the usual places of attack will carry arsenic in sufficient quantity for some weeks to kill any maggots which may be deposited after jetting. Jetting does not prevent

strike, but will destroy the maggots before they do harm to the sheep. The important point is for the flock owner, where early storms are experienced, to apply his favoured method of protection to all his sheep as soon as convenient.

The same seasonal conditions are also conducive to an increase in internal parasites. The worms which usually cause trouble in a flock become numerous while the sheep are still doing well on fresh green feed. Consequently, the risk of pasture contamination is serious. When the grass becomes dry and less nutritious as the season advances, the wormy sheep will suffer severely, while heavy lamb losses may be expected. Early drenching for the control of stomach worms will do much to protect the sheep. Where necessary, drenching should be continued at monthly intervals.

UNIFORMITY IN FAT LAMBS.

One of the greatest hampering factors in the fat-lamb raising industry is the lack of the right type of crossbred ewe. In fat-lamb raising in Queensland, a beginning has often to be made with the Merino ewe. The type chosen should be of the large-framed, strong-woolled kind. On ewes of this type, long-woolled rams—such as the Romney Marsh, Border Leicester, or Lincoln—should be used. The ewe progeny of this mating should be reserved as future breeders in the fat-lamb producing flock. To produce the most desirable lamb at an early age, the use of Southdown, Dorset Horn, or Shropshire rams on these crosses is advised.

Pure Corriedale ewes make excellent mothers for the early fat lamb.

Time is saved and impetus is given to the fat-lamb industry when farmers acquire ewe weaners of the right crosses. It is always a pity to see these potentially valuable breeders slaughtered.

SHEEP DIPPING.

The only known method to combat lice and ticks (ked) in sheep successfully is to dip. A preparation of proved efficiency should be used. If a powder dip is chosen, great care should be taken in the mixing. The powder in small proportions should be mixed with water and stirred until the consistency of an ordinary mustard mixture is attained. When the whole of the powder necessary to charge the bath is so mixed it may be added to the full quantity of water in the dip. This should be done overnight.

It is necessary to follow carefully the directions as to quantities given by the manufacturers. Sheep get most benefit from dipping when a month to six weeks off shears. Never dip sheep when they are hot or thirsty. For the job, avoid, if possible, extremes of heat and cold. Let the sheep drain thoroughly in the shade, if practicable. Treat the dipped sheep gently and avoid driving them for any considerable distance.

Plate 197.

On the Shearing Board at Northampton Downs, Central Queensland.

WHEN BUYING FLOCK RAMS.

Even in these more or less enlightened days too many graziers still hold the opinion that practically any flock rams will do, so long as they are pure merino and cheap enough. No greater mistake could be made in the breeding of sheep. The ill-effects of such a policy are lasting.

In the selection of rams for a certain line of ewes, familiarity with the type and qualities of the latter are essential.

A grower without the necessary knowledge to successfully "nick" the sexes would be well advised to employ a man fully qualified for this important work.

Violent contrasts in the types of ewes and rams should be avoided. For instance, if a grazier has a medium flock of, say, 64's quality, and it is desired to strengthen the clip somewhat, it is not advisable to join the strongest of merino rams. This is an attempt to do in one year something which should take not less than four years. Breeding for an alteration of type should be gradual.

Rams selected for a certain line of ewes should be slightly stronger in fibre than the ewes with which they are to be joined, and, further, should be specially selected to rectify any pronounced fault in the ewe flock.

A guinea or two is neither here nor there in the acquisition of suitable flock rams.

MERINO TYPES TO SUIT COUNTRY AND CONDITIONS.

In merino sheep it is not always advisable, or even possible, to breed the type one would wish. To be successful, a farmer should realise that the type should be chosen to suit his country and local conditions. For instance, it should be obvious that the sheep carrying the clothing wools of Western Victoria would prove a failure in the western districts of Queensland.

In selecting a type, the first consideration should be constitution. In the West sheep frequently have comparatively long distances to go to water. A sheep then should be introduced that is fitted by nature to withstand this hardship. Judged from a financial point of view—and, after all, everything practical in the industry comes back to a matter of pounds, shillings, and pence—consideration should be given to the type of animal which gives the yield per head rather than price per lb.

Having evolved a type suitable to his particular conditions, it is important that the farmer should stick to the stud supplying the rams. It takes a man of experience in breeding to successfully maintain a flock while chopping and changing about from stud to stud.

Pay the price for the better-type rams and, if necessary, pay the right man to select them, having regard to the type of ewes with which they are to be mated.

Milk Fever and How to Treat It.

SINCE the discovery of udder inflation for the treatment of milk fever, this disease has had few worries for the dairy farmer, but it is considered that a few notes on it, describing the precautions to be observed in udder inflation, some of the undesirable consequences that may follow, and recent advances in treatment, may be useful.

Usually the condition has been present some time before treatment is applied, and the affected beast will be down and more or less unconscious.

The udder should be wiped clean with a clean damp rag, and then a clean towel should be placed under the udder to prevent contamination from the soil. The beast should then be propped up on its breast bone in as natural a position as possible, taking care that the hind legs are in a normal position and not causing undue pressure on the udder. In very advanced cases this may not always be possible, but it should be attempted.

Strip the udder of any milk present and then commence inflation with a teat syphon. Each quarter is inflated firmly and the teats are tied off at the bottom with clean tapes to prevent the escape of air. The udder should then be massaged gently to distribute the air throughout the organ. The tapes should be untied about half an hour after they were put on. If no improvement is noted after three hours, inflation should be repeated. The most undesirable after effect that may follow treatment by udder inflation is mammitis. To avoid this the following precautions should be observed:—

(1) The teat syphon used should be sterilized thoroughly before use by boiling.

(2) Take every precaution during inflation that the teat syphon does not come in contact with any contamination; should that happen, immerse the syphon in boiling water before continuing its use.

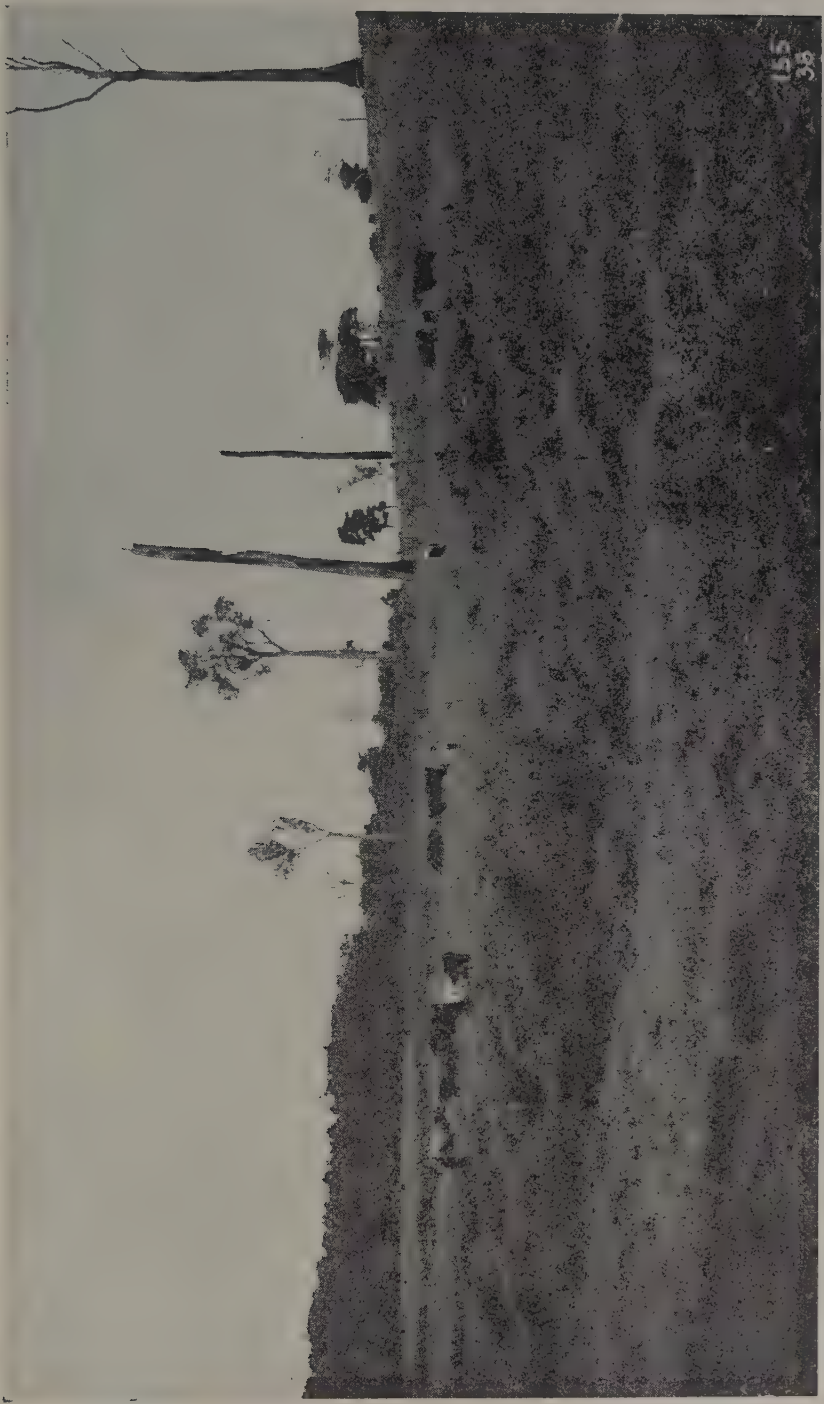


Plate 198.

From Dense Rain Forest to Hock-deep Pastures.—Newly developed dairy country in the Utchee Creek land settlement area, North Queensland.

These precautions are against the possibility of introducing any infection into the healthy udder.

(3) If a quarter of the udder of a cow being treated for milk fever is affected with mammitis, or has been so affected at any time, that quarter should be the last inflated; and, following use on that quarter, the teat syphon must be sterilized thoroughly by boiling before being used again.

The necessity for such a precaution is obvious.

Despite the fact that most cows treated for milk fever by udder inflation record an uneventful recovery, it has been found that better results are obtained by the subcutaneous (under the skin) injections of a substance known as calcium boro gluconate. It is well known that in milk fever the calcium content of the blood drops considerably, and the injection of calcium boro gluconate aims at restoring the lost calcium balance. In addition to being a more convenient treatment, other advantages it possesses over udder inflation are that there is no risk of introducing or spreading mammitis, recovery is more rapid, relapses are less likely to occur; and also the method may be used as a preventive. The drug is put up in convenient form commercially, and the local chemist will be able to advise where to get it.

The drug is usually issued in cartons containing 2½ oz., the contents are dissolved in 10 oz. of hot water recently boiled and then allowed to cool to body temperature before use.

The dose given is sufficient for one treatment, and should be injected under the skin at various parts of the body—do not inject all the solution in one place. The usual precautions are taken regarding sterilization of the syringe and needles and antiseptic precautions at injection.

It has been found that repetition of the dose is rarely necessary.

Some cows are known to be more subject to milk fever than others, and in such cases it has been found advisable to give an injection immediately after calving, followed by a second injection about twenty hours later. For these injections, the dose should be half that used for curative treatment.

Whatever the method of treatment adopted, it is advisable to cover the animal with a rug and in no circumstances should the beast be drenched, as, because of the paralysis extending to the throat, the cow is unable to swallow, and any liquid forcibly given may enter the lungs and set up pneumonia, which almost invariably proves fatal.

When the treated cow gets to her feet, it is advisable that some definite form of after treatment should be adopted. The udder should not be touched for at least twelve hours after the cow has risen, and milking "dry" must be avoided. Small quantities of milk should be drawn off at frequent intervals on the following day, and the diet should be restricted.

BOBBY CALVES.

If a substantial and lasting success in the development of a trade in veal is to be achieved, the greatest care must be given to methods of feeding, and the condition in which calves are marketed. The trade has already increased the income of the dairy farmer; hitherto, it has been the practice on many farms of limited carrying capacity to kill all calves at birth.

Some farmers, unfortunately, have made a practice of sending calves to the meatworks as soon as they are born, and that accounts for the high percentage of condemnations, of which the principal cause is immaturity.

The milk of a newly-calved cow is fed to pigs and poultry, and, therefore, is not wasted, but it should be borne in mind that this milk would show a better return if fed to the new-born calf than if fed to pigs. The value of this milk is often not so much as a weight increaser as a preventer of weight loss. This is true of the larger breeds. With the smaller breeds its value is, of course, primarily for growth.

The law provides for a dressed weight of not less than 40 lb., and an age of not less than 14 days.

Condemned calves are a direct loss to the farmer, and they also involve the meatworks in loss on account of wasted effort and loss of time.

Mature veal is a wholesome food article, while immature veal, which has a laxative effect on the consumer, is not allowed on the market for consumption.

This loss, due to immature calves, can be avoided if the calf is fed for a few days on its mother's milk. The calf should weigh 80 lb. or more before being sent to the meatworks. This live weight will give a dressed carcase of approximately 40 lb.

SOME CAUSES OF DIMINISHED DAIRY PROFITS.

It is a mistake to think that higher prices offer the only solution of the dairy farmer's problems. Increased and cheaper production per acre also is of importance. Better methods of management, and the cutting out of all waste can do much to make dairying profitable. Sick and low-producing cows are among the biggest charges in the profit and loss account of every dairy farm.

It is very important, too, to guard against disease infection—especially mammitis and other disorders that spread rapidly through a herd.

By isolation and careful management, it is possible to keep dairy stock diseases down to a minimum. A close study of feeding methods will help to keep a herd healthy and in good condition, and thus render the animals less liable to contract infectious or other diseases.

The unprofitable cow is one of the dairy farmer's worst handicaps, economically speaking. Frequently she is a cow that pleases the eye, yet deludes her owner into the belief that she is filling the bucket with the rest of the team. Each herd collectively must show profitable returns to the owner, otherwise he soon may be asking his bank for an overdraft. How many farmers can show that they are getting a profit from each cow in the herd?

It costs no more to own, feed, or milk, profitable cows, so it is obviously unwise to persevere with unprofitable ones. The adoption of herd recording, therefore, needs no argument to commend it.

A registered pure-bred bull of known production record is a decided advantage, and farmers who will persist with a bull of unknown quality are certainly risking heavy loss.

Plate 199.

A New Banana Plantation on the South Coast.

Food for Bacon Pigs.

THE Department of Agriculture and Stock offers the following advice to farmers, especially in districts south of Rockhampton.

Soft, Oily Pork.—Although several foods may be the cause of this soft condition, all the evidence points to the fact that the chief cause of the trouble is the feeding of peanuts or meal manufactured from peanuts to pigs which are being finished or topped up for the market. Maize and other grain foods are relatively scarce and high priced, and as peanuts produce particularly fast growth in pigs, farmers are naturally tempted to use them or the meal in place of grain. The position could be relieved if pig raisers would concentrate their peanut feeding on the breeding stock and young store pigs, which will make very good use of surplus peanuts, and then other foods available could be kept for the pigs from the store stage until they reach bacon weights. Separated milk, root crops, pumpkins, lucerne (either as green fodder, hay, or chaff), and small quantities of pollard, meat meal, and pasture can be used to make up good rations in the absence of maize.

Yellowish-coloured Pork.—It is known that the probable cause of this condition is an excess of carotin, a colouring matter in plant life, and which is present especially during the early life of the plant and at the stage when (as in the case of pumpkins) the crop is fully ripe or over-ripe. The feeding of an excess of green wheat, oats, or barley, in the absence of, or short supply of, milk may also be responsible; so also may the continuous use of grass or of lucerne as the principal food.

Low-conditioned Pigs.—Lack of condition is, of course, invariably due to lack of sufficient nutritious food. When pigs are in such a condition they become more liable to infestation by internal and external parasites, which irritate the animal and cause much restlessness, especially at night.

It is better to keep fewer animals and to feed them properly than to attempt the keeping of more than the number for which food is available. It is better, too, to market the pigs when light and prime than to carry them on to heavier weights with loss of condition. Where milk is in short supply, meat meal may be used as a substitute. In all cases, the pigs should have clean drinking water and mineral material like charcoal.

Bruised and Damaged Pigs.—Where pigs are weakened as a result of lack of condition and where they are soft in texture—the result of improper food—they bruise much more readily, and tend to be more discontented. The only way to avoid bruising is to have the animals in the primest condition (not over-fat) and to treat them kindly and not force or beat them when loading or unloading. Avoid kicking them or forcing them through narrow gateways or over rough stony yards.

Over-fat Pigs.—Despite high-priced foods, there is still a proportion of over-fat and very heavy weight stock coming forward. Pigs should not be fed too heavily on grain, but should be kept growing and given abundant exercise in grassy pastures. It is a mistake to keep pigs penned up continuously in small sties and bare yards. The use of flesh-forming foods like milk, meat meal, lucerne, greenstuffs, &c., and mineral matters will tend to overcome any tendency to over-fatness.

SIZE OF BREEDING SOWS.

Size is an important feature in breeding pigs, yet some breeders do not give it sufficient consideration.

One of the chief objectives in pig raising is to get pigs to marketable weights in the shortest possible time. To obtain the desired rapid development and still have a finished pig with a light covering of fat, it is necessary to breed from pigs which are big within their class. That is to say, pork type breeding stock—such as Middle Whites—should be big animals of their category if their progeny are to grow quickly to porker weights. Bacon type breeding stock—such as Large Whites—also should be big of their type if their progeny are to develop similarly to baconer weights. The extreme bacon type of breeding stock could, of course, be used to produce fast growing porkers, but such porkers, under normal feeding conditions, would not be sufficiently mature to give good carcases at porker weights. Breeding pigs should be big within their type.

Size is inherited in pigs as it is in horses, and trying to grow a small type pig into an extreme bacon type is like trying to make a pony into a draught horse.

Observations lead to the belief that size within a breed is frequently lost through mating stock before they are sufficiently grown.

A large breeding sow, provided she is not too fat and clumsy, is more likely to produce a litter of large pigs and to be able to suckle them better than a smaller sow, under similar conditions.

Records of a large number of breeding sows show that sows which are mated when between nine and twelve months old are more productive throughout their breeding career than sows mated earlied or later.

Under Queensland conditions, it is common to see sows mated at five to six months old when they are barely bacon weight, but this practice does not give the sows a chance to develop and become productive mothers.

The best recommendation is to mate sows when they are about nine months old, or when they have reached a live weight of approximately 250 lb. In cases where sows are mated when very young, either by accident or design, they might be given a chance to develop by withholding them from service for some weeks after their first litter has been weaned.

THE PIG MAY RIVAL THE COW AS A MONEY MAKER.

Pig raising is an occupation with no appreciable peak load of work to clash with other jobs in dairy farming, and the by-products—skim milk, buttermilk, or whey—are converted readily into cheap and appetising pork.

On practically every dairy farm in Queensland, pigs have been and always will be a valuable side-line. Too often, however, the pig has been regarded as merely necessary to consume milk or whey which would otherwise be wasted.

Pigs, properly housed and fed, may even rival the cows themselves as money makers.

The open-air or pasturage system, under which pigs are allowed to graze at will in a good, well-grassed paddock, enables the dairy farmer to get the full benefit of his by-products. Where crops and pasturages are available, the young pigs can be reared chiefly on those feeds—the skim milk being reserved largely for the older pigs being topped off in the sty. The young pigs will, of course, go through the topping-off process in their turn.

Cheap and effective shelter can be provided in the pig paddocks. A small shelter can be quickly knocked together by any handy man. It should be strong and easily movable (on skids for preference); and, of course, should be rain, wind, and draught proof.

THE KEEPING OF BREEDING RECORDS.

On every farm where the farmer breeds his own pigs some form of breeding record should be kept, for a record of the productivity of each sow, as well as a herd average, will contain information of much value to the observant breeder. Such records are not difficult to set out, and but a few minutes would be required each week to keep the book up to date. Therefore, a very small expenditure of time and money will ensure a supply of information which may be the means of adding materially to the income from the piggery.

A simple record may be prepared in the following way:—Take an ordinary exercise book or card, and across the top of two facing pages, or the card, rule two lines, between which the breed, name, and date of birth of the sow may be written. Then rule vertical lines to the bottom,

and in the spaces between these lines there should be written such information as date of service, date of farrowing, number born, number weaned, pigs sold or killed for meat, gross returns, and remarks. In the remarks column, a note should be made of any pigs born dead, the causes of losses up to weaning, and deaths after weaning, as well as remarks concerning the type and growth rate of the litter.

When a complete breeding record is kept for each sow on the farm, the owner can, by studying the individual records, note the sows which have had small litters, or have not reared litters well, and so on. Therefore, if a sow's performance is not good, she should be replaced. By doing this, the average for the herd is raised, to the ultimate benefit of the owner.

Another use for records is to compare the results obtained from different foods. By feeding different rations to groups of pigs, and keeping a record of the amount of food eaten and the weight increases made on different rations, the farmer can determine for himself the foods which will give the greatest gain in weight for the least cost or labour.

The useful information to be gained from breeding records does more than merely compensate for the brief time and light expense involved.

MANGE IN PIGS.

Caused by a minute, worm-like mite which lives in the hair follicles and sweat glands of the skin, the condition described as demodectic mange in pigs is one which the pig raiser ought to know all about, because its presence sometimes results in the degrading of carcases, especially of those submitted for export.

The mites are microscopic in size, measuring only one-hundredth of an inch in length.

The lesions of demodectic mange first appear, as a rule, on the snout, eyelids, elbows, and knees. In the initial stages, the areas attacked have a reddened, scurfy appearance with numerous small, hard nodules scattered over them. These become infected with bacteria and begin to ooze pus and serum. The disease gradually spreads over the throat, breast, abdomen, and elsewhere where the skin is soft and thin.

In its early stages, demodectic mange may be checked by frequent applications of crude oil. The disease, however, is very difficult to cope with, and once it appears it is best to get rid of infected animals and to isolate all other animals which have been in contact with them for at least a fortnight. In addition, the sties should be cleaned out thoroughly with boiling water and soda, and then disinfected.

Control of Seedling Pests of Cotton.

PLANTING is a critical period for the cotton-grower, as failure to obtain a reasonable stand at the right time may greatly prejudice the success of the crop. For a number of reasons, planting should take place as soon as temperature and moisture conditions permit. This is particularly desirable in order to avoid severe insect damage, both in the early and subsequent stages of the growth of the crop. The Central district of Queensland, wherein the bulk of the cotton-growing industry is situated, is very prone to hot, dry spells and severe corn-ear worm attacks from mid-January to April. Planting should therefore be completed, if possible, between late September and the end of October, in order that the plants may be well advanced when this period of likely adverse conditions commences. If suitable planting rains do not fall in September and October, the land should be kept in such a condition that full advantage can be taken of any rains which may be received. It is seldom that a satisfactory crop is obtained from plantings made after mid-November, except under especially favourable conditions.

The main pests associated with the early stages of the crop include false wireworms, cutworms, thrips, aphids, jassids, grasshoppers, flea beetles, and corn-ear worms.

In control, two factors are of importance, namely weed growth and the location of the block of cotton. All the pests just mentioned breed up on weeds many of which shoot up with the late winter and spring rains. It is, therefore, essential to maintain clean fields and headlands for at least a month before planting. Sandy soils, if not treated in this way, are very liabe to heavy cut-worm attacks on the seeding cotton. Ploughing, harrowing, and planting should not be carried out in one operation, especially if the land is carrying a growth of weeds. There are years when such a procedure may be quite successful, but on the general run of seasons it does not pay. Weed patches are frequently centres of cutworm infestation, and when they are ploughed under many

of the larvae live until the cotton seedlings are large enough to be attacked. With regard to the location of the cotton fields, it is advisable to plant cotton as far away as possible from weedy fields or crops such as maize, lucerne, and tomatoes. Weeds breed many pests, and the crops indicated often carry heavy populations of corn-ear worm, and lucerne occasionally has, in addition, larvae of the cotton web spinner. If for any reason, such as the drying out of the host plants or disturbance by parasites or any mechanical means, the pest larvae migrate, the nearby cotton may suffer an extensive loss of stand before the pests are checked, unless, of course, the farmer is fully aware of the possibilities of such a position.

Land which has been cropped with cotton for many years should not be abandoned to weed growth, for it is not a costly procedure to effectively grass these areas, and thus remove a potentially dangerous pest-breeding source.

It is recommended that heavier seedling than is necessary to produce a normal stand of cotton should be practised, for it is far better to thin out excess plants than to replant depleted stands. Wireworms are seldom responsible for the loss of a reasonable stand if the heavy planting method is followed.

Where it is necessary to apply chemical control measures against invading swarms of caterpillars. both baiting with the usual cutworm mixture and swabbing the rows of cotton with a molasses-arsenic solution are productive of satisfactory results.

In the swabbing method a solution of the following formula is used:—Lead arsenate, $\frac{1}{2}$ lb.; molasses, 1 gallon; water, 6 gallons. The lead arsenate and molasses are mixed separately in water, then one added to the other, and the whole made up to six gallons and thoroughly stirred.

The fluid so prepared is flipped on to the attacked plants and five or six rows in front of the infested area wiht a whitewash brush or a bundle of straw. One gallon of this mixture will do approximately 300 yards of a cotton row.

Freshly-cut weed hosts, such as the pigweeds and hogweed, dipped in the swabbing solution and spread as a barrier in front of the invading larval swarm make an efficient and cheap bait.

Where the plants are very small, the use of baits is preferable, as in the swabbing method the plants are often badly injured before the larvae are able to obtain a lethal dose of the poison. However, once the plants are infested, swabbing with the sweetened poisoned solution is the most effective way of ridding the plant of the pests.

The cutworm bran bait scattered under and around the plants is a very successful method for combating cutworms and grasshoppers when they become established in the field.

It is strongly recommended that every cotton-grower should have 4 gallons of molasses and 2 lb. each of lead arsenate and Paris green on hand, so as to combat an insect attack as soon as it is noticed. The time required to obtain the materials for baits or swabbing is frequently so long that the damage is done before the insecticides arrive. Hence a supply on hand is a good form of crop insurance. Both the lead arsenate and Paris green are highly poisonous, and must accordingly be used with discretion.

CUTWORMS IN SEEDLING COTTON.

During the spring and early summer months one of the most serious pests of seedling cotton with which the farmer has to contend is the common cutworm.

In years of cutworm outbreaks the loss of stand may necessitate replanting. Replanting is successful only when the soil contains adequate soil moisture, and some time may elapse between a cutworm outbreak and the resowing. Late replant crops are rarely so successful as those sown early, and for that reason precautions should be taken against cutworms to ensure a commercial stand of cotton with the first seeding.

Cutworms have been very destructive to autumn sown crops, such as lucerne, in some districts, and good spring rains may favour widespread moth emergence shortly before cotton crops are planted. Farmers, therefore, should be familiar with the pest and ready to deal with it if necessary.

The cutworm—the larva of a dark-brown moth—is a stout, soft-bodied greyish-brown to greyish-green caterpillar growing up to 1½ inches in length, which feeds principally on low-growing weeds. When these food suppiles are disturbed in any way, the caterpillars may migrate to nearby cotton fields or, if already in the paddock, they may damage the germinated cotton. The pest feeds at night and normally attacks the stem just above the ground level.

Cutworm losses in cotton may be considerably reduced by a good cultural system. Thorough ploughing, in which weeds are destroyed completely, is necessary. Patches of weeds missed during ploughing are frequently the centre from which extensive cutworm damage may radiate. Ploughed land should be kept free of weeds for at least a month before the planting, which, if the rains are suitable, will be carried out between mid-September and mid-October. Early ploughing is, therefore, required. After planting, weeds should be kept in check.

If weeds are ploughed under immediately prior to planting, the risk of cutworm injury is increased greatly, for many of the eggs and larvae on the weeds will survive and attack the cotton seedlings.

Virgin land. or Rhodes grass paddocks which are being prepared for cotton, usually contain little weed growth, and this, to a great extent, minimises the risk of cutworm injury. Under these conditions, a later planting may be made without incurring severe seedling losses. Even in these cases, however, early ploughing is preferable, in order to ensure the preparation of a good seed-bed, and to allow adequate time for the organic matter to break down.

Where direct control of the cutworms is required, insecticides must be used. The poisoned bran bait method has been tested thoroughly, and is recommended as a reliable control measure.

To prevent the entry of invading swarms, the use of one or more baited furrows is necessary. When the pest is within the field, the bait may be broadcast or applied in lines along the rows of cotton seedlings. If broadcast, about 50 lb. dry weight of bran will be required per acre; if distributed along the rows, 25-30 lb. dry weight of bran per acre should be sufficient for baiting purposes. The formula of the poison bran bait is as follows:—25 lb. bran, 1 lb. Paris green, 2 quarts of molasses, and enough water (2-2½ gallons) to make a friable crumbly mash which can be broadcast without difficulty. The bran and Paris

green are first mixed dry; the molasses is dissolved in the water, and after being mixed the whole is well stirred up to make the mash as required. As the cutworms are night feeders, the bait should be applied in the later afternoon and evening.

HOW TO LIFT OLD FENCE POSTS.

Removing is sometimes a difficult job, and usually means some hard work with a crowbar. A device like the one shown will enable a horse to get an almost vertical

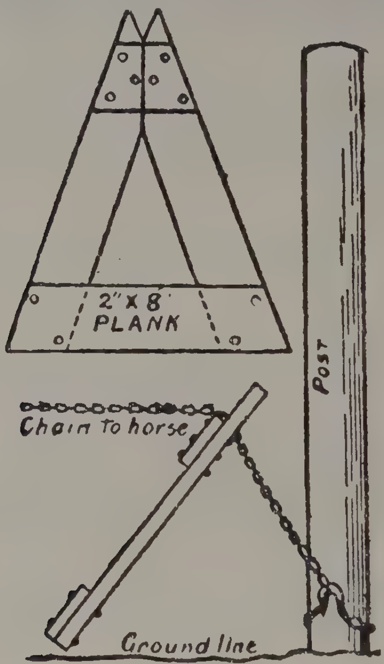


Plate 200.

pull, and in soft ground the posts can be pulled out with very little effort. A bush method of making use of the idea is to obtain a forked branch cut as shown in the sketch.

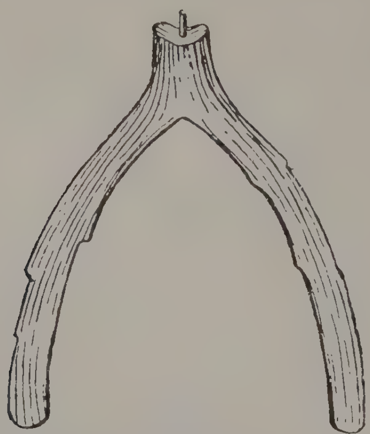


Plate 201.

A notch is cut in the single end, and a piece of round iron, such as a bolt with the head cut off, is placed in the centre of the notch. A link of the chain can be pulled over this to prevent it from slipping when the pull comes on it.

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Adler, Tinana	Nevertire	White Leghorns, Australorps, Rhode Island Reds, and Langshans
F. J. Akers, Eight Mile Plains	Elmsdale	White Leghorns and Australorps
E. J. Blake, Rosewood	Sunnyville	White Leghorns, Australorps, White Wyandottes and Rhode Island Reds
R. H. & W. J. Bowles, North Rockhampton	Glenmore Poultry Farm and Hatchery	White Leghorns and Australorps
J. Cameron, Oxley Central	Cameron's	Australorps and White Leghorns
M. H. Campbell, Albany Creek, Aspley	Mahaca Poultry Farm and Hatchery	White Leghorns and Australorps
J. L. Carrick & Son, Manly road, Tingalpa	Craigard	White Leghorns
N. Cooper, Zillmere road, Zillmere	Graceville	White Leghorns
R. B. Corbett, Woombye	Labrena	White Leghorns and Australorps
T. G. Crawford, Stratford	Rho-Isled	Rhode Island Reds
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme	White Leghorns, Australorps, and Rhode Island Reds
Dixon Bros., Wondecla	Dixon Bros.	White Leghorns
Rev. E. Eckert, Head street, Laidley	Laidley	Australorps, White Leghorns, and Langshans
Elks & Sudlow, Beerwah	Woodlands	Australorps and White Leghorns
W. H. Gibson, Manly road, Tingalpa	Gibson's	White Leghorns and Australorps
Gisler Bros., Wynnum	Gisler Bros.	White Leghorns
G. Grice, Loch Lomond	Kiama	White Leghorns
J. W. Grice, Loch Lomond	Quarrington	White Leghorns
Mrs. M. Grillmeier, Mount View, Milman	Mountain View	Australorps, Minorcas, and Rhode Island Reds
C. & C. E. Gustafson, Tannymorel	Bellevue	Australorps, White Leghorns, and Rhode Island Reds
P. Haseman, Stanley terrace, Taringa	Black and White	Australorps and White Leghorns
C. Hodges, Kuraby	Kuraby	Anconas and White Leghorns
J McCulloch, Whites road, Manly	Hindes Stud Poultry Farm	White Leghorns, Australorps, and Brown Leghorns

Name and Address.	Name of Hatchery.	Breeds Kept.
A. Malvine, junr., The Gap, Ashgrove	Alva ..	White Leghorns and Australorps
H. L. Marshall, Kenmore ..	Stonehenge ..	White Leghorns and Australorps
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White Leghorns, and Langshans
J. A. Miller, Racecourse road, Charters Towers	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	Australorps, Brown Leghorns, and White Leghorns
Mrs. H. I. Mottram, Ibis avenue, Deagon	Kenwood Electric Hatcheries	White Leghorns
J. W. Moule, Kureen	Kureen ..	White Leghorns and Australorps
D. J. Murphy, Marmor ..	Ferndale ..	White Leghorns, Brown Leghorns, Australorps, Silver Campines, and Light Sussex
S. V. Norup, Beaudesert Road, Cooper's Plains	Norup's ..	White Leghorns and Australorps
H. W. & C. E. E. Olsen, Marmor	Squaredeal Poultry Farm	White Leghorns, Australorps, Black Leghorns, Brown Leghorns, and Anconas
A. C. Pearce, Marlborough ..	Marlborough Stud Poultry Farm	Australorps, Rhode Island Reds, Light Sussex, White Wyandottes, Langshans, Khaki Campbell and Indian Runner Ducks, and Bronze Turkeys
E. K. Pennefather, Oxley Central	..	Australorps and White Leghorns
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farm	White Leghorns, Australorps, Langshans, Rhode Island Reds, and Brown Leghorns
G. R. Rawson, Mains Road, Sunnybank	Rawson's ..	Australorps
J. Richards, Atherton	Mount View Poultry Farm	White Leghorns and Australorps
H. K. Roach, Wyandra	Lum Burra ..	White Leghorns and Australorps
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
A. Smith, Beerwah	Endcliffe ..	White Leghorns and Australorps
A. T. Smith, The Gap, Ashgrove	Smith's ..	White Leghorns and Australorps
T. Smith, Isis Junction	Fairview ..	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
A. J. Teitzel, West street, Aitkenville, Townsville	Teitzel's ..	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's Poultry Farm	White Leghorns and Australorps
W. A. Watson, Box 365, P.O., Cairns	Hillview ..	White Leghorns
G. A. C. Weaver, Herberton road, Atherton	Weaver's Stud Poultry Farm	Wyandottes, Indian Game, Barred Rocks, Australorps, White Leghorns, Anconas, Rhode Island Reds, Buff Orpingtons, Black Orpingtons, and Buff Leghorns.
T. Westerman, Handford road, Zillmere	Zillmere ..	Australorps and White Leghorns
H. M. Witty, Kuraby	..	White Leghorns and Australorps
P. A. Wright, Laidley ..	Chillowdeane ..	Brown Leghorns, White Leghorns and Australorps
R. H. Young, Box 18, P.O., Babinda	Reg. Young's ..	White Leghorns, Brown Leghorns and Australorps

MARKETING TABLE POULTRY.

To obtain the highest returns, it is necessary to market table poultry in the best possible condition. The term condition covers the state of the feather, flesh, and age of the bird. If culling of the layers is given the attention that it should, little can be done to improve the returns from culled hens.

Experiments have indicated that the flesh carried by a well-fed hen that has finished egg production cannot be increased economically by extra feeding, because the hen that has lost weight through regular laying takes too long to respond. The best practice, therefore, is to market culled hens before they become a mass of pin feathers. This condition applies particularly about this time of the year.

The right marketing of cockerels is of particular importance. This class of fowl sells reasonably well at any stage of development, if it is sold before it reaches what is known as the "staggy" stage. This term is applied to birds commencing to show spur development. To obtain the maximum value for cockerels for table purposes, they should be sold while the spur is still in the bud stage. Many breeders keep cockerels until this stage has passed, and, consequently, do not get top prices.

In the marketing of cockerels, it is well to examine the feather growth; cockerels with a lot of pin feathers do not dress attractively. This applies particularly to birds such as the Australorp, because of the colour of the plumage. Pin feathers on white feathered birds are not so noticeable.

Again, certain breeds are not well-fleshed at all times. This applies generally to the bigger birds—such as the Light Sussex and the Rhode Island Red.

To summarise—poultry raisers with cockerels to market should, firstly, bear in mind the fact that birds with indications of spur development do not realise the maximum value; secondly, that the rate of development of cockerels from twenty to twenty-four weeks of age is not as great as that which takes place earlier, consequently any increase in body weight is at a greater cost; and, thirdly, that it is undesirable to market cockerels carrying a lot of pin feathers, and those that are scraggy and not well fleshed.

CARE OF GROWING PULLETS.

Any special attention or care given to pullets during their growing stage will be well repaid by greater production when they come into profit.

The main points in management which ensure profitable pullets are:—Perching early, separation of sexes, small units, feeding, and sanitation. Pullets should be taught to perch as soon as possible after they have been removed from the brooder. The earlier they become accustomed to perching, the more they spread at night. This prevents crowding and ensures a good air supply for all.

The separation of sexes as soon as the males can be distinguished, gives them a much better chance of making good development. Small units also assist in their development and decreases the percentage of stunted pullets, which is the usual result when large numbers are housed

together. It is advisable not to house more than 100 pullets in any one unit.

Feeding also is important. The ration should be correctly balanced and the birds given as much food as they will eat. The birds should be given as much mash as they will consume in about 20 minutes; if they require more, it should be supplied. It is advisable to give two meals of wet mash, one early in the morning and the other at midday.

In no circumstances, should wet mash be left lying about, as it sours rapidly and puts the birds off their food. Dry mash hoppers should be kept well filled and always open. The feeding troughs of both systems should be long enough to provide ample feeding space. Lack of sufficient feeding space is a very common error in dry mash feeding. At least one foot of space should be allowed for each ten birds.

Green feed may be supplied with the midday meal, unless the birds have access to a well-grassed run. Wet mash should form the bulk of the midday meal, unless the dry mash method is used. In dry mash feeding, a small quantity of mash mixed with the greens will tend to increase the consumption of greenstuff As an evening meal, the pullets should be given as much grain as they will consume.

Clean, cool, fresh water should always be supplied daily, and the drinking vessels should be kept in a shaded position.

Coarse sand, shell grit, and charcoal should always be available and kept in suitable containers. Each of these materials has an important influence as an aid to digestion and assimilation of food, and is, therefore, invaluable in maintaining health in the flock.

Sanitation also is important and covers the regular cleaning of pullet pens. Wet patches should not be allowed to surround the drinking vessels, and the treatment of perches with creosote to prevent an invasion of blood-sucking parasites should not be overlooked.

Effect of War on Fertilizer Supplies.

THE Director of the Bureau of Sugar Experiment Stations (Dr. H. W. Kerr) advises that, with the entry of Britain and Australia into the European War, there exists a grave danger that adequate supplies of necessary fertilizers may not be available to farmers in Australia: this is, of course, a matter which vitally concerns the Queensland cane grower.

Immediate action was taken to determine the present position in this State, and a conference of representatives of the fertilizer companies and the Government was held to discuss the outlook. It would appear that there is little to fear in respect of superphosphate supplies, while the availability of sulphate of ammonia should meet normal requirements. But the amounts of potash now in stock or on the high seas gives us reason to believe that action should be taken to utilise what is available to the best advantage.

The matter has still to receive the final consideration of the Government, but as a voluntary effort to safeguard the future, the fertilizer distributing companies have agreed upon a plan whereby the sales of potash will be carefully scrutinised during the ensuing months.

The details of this plan will be made available to those concerned in due course: but we take this early opportunity of informing cane growers of the reason why their orders for consignments of potash or mixtures rich in potash may not be filled. The desirability of utilising mixed fertilizers of suitable composition has always been stressed by the Bureau; but in times of emergency—and the present is such an occasion—it may be necessary to restrict these mixtures in a manner which will ensure that limited plant food stocks will be employed for the greatest good of the greatest number.

For instance, all the experiments of the Bureau, to date, have shown no beneficial effects on cane yield from the use of potash in the Burdekin district. Virtually all gains from fertilizers in these parts can be ascribed to the nitrogen of the mixtures. Therefore, we feel confident that the Burdekin farmers can safely restrict fertilizer purchases, for a year or two at least, to meatworks manure and sulphate of ammonia,

together with superphosphate if desired. This will liberate a quantity of potash for growers on soils deficient in this plant food.

Similarly, farmers cultivating the alluvials of North Queensland could confine their purchases to similar materials for a year or two, without impairing crop yields at all. These soils are generally rich in potash, notably where complete fertilizers have been used consistently.

It is for the red volcanic soils of the State generally, and the schist soils of North Queensland, that potash is most necessary. But farmers should not be stampeded into thinking that unless they make heavy applications this year, they may be in trouble a year hence. On the contrary, the fertilizer companies are acting in the best interests of all, and we are all agreed that light annual applications of this plantfood will confer greater benefits than the immediate consumption of all available stocks, with the risk of nothing for next year.

To sum up, we would advise:—(1) Farmers who are cultivating soils for which Sugar Bureau No. 1 Mixtures are advised might well confine their purchases to mixtures containing *no potash* for the present; (2) where Sugar Bureau No. 2 Mixtures have been recommended, employ a mixture with a moderate amount of potash; and (3) where Sugar Bureau No. 3 Mixtures are advised, purchase the fertilizer of this type containing the highest percentage of potash available.

It would not be out of place, at this time, to point out, also, that cane growers could help themselves in respect of sulphate of ammonia purchases for 1940 (should there occur any shortage), by placing as much as possible of their fallow land for 1940 planting under a leguminous green manure crop this spring. Such a policy would ensure a minimum of nitrogen requirements for cane planted next year.

In conclusion, it is sincerely hoped that, as the position is clarified, it may be possible to announce that ample supplies of potash are coming forward from overseas. If such should be the case, the present rationing plan can be suspended. But it must be remembered that this country suffered an acute shortage of potash in the years 1914-18, when fertilizer requirements were nothing like what they are to-day, and it is always better to play safely than to gamble on an obscure future.

POINTS FOR NORTH QUEENSLAND POTATO GROWERS.

Potato planting in North Queensland rarely commences before April, and usually continues until well into May. Because of this, harvesting commences long enough after winter to allow the potato moth to become very active. To prevent damage from this source, great care is required. Effective hilling should be practised during the growth of the crop, and immediately before it is lifted the whole field should be very carefully hilled to prevent infestation of the remaining crop after harvesting has commenced. No way of lifting is completely efficient, as some potatoes will remain partly exposed in the field and thus become a possible source of infestation as harvesting proceeds. Continued efforts to restrict the moth's field of activity is, therefore, necessary and the following additional precautions are recommended:—

1. Do not plant moth-infested seed unless it has been fumigated for the destruction of moths, larvae and eggs.

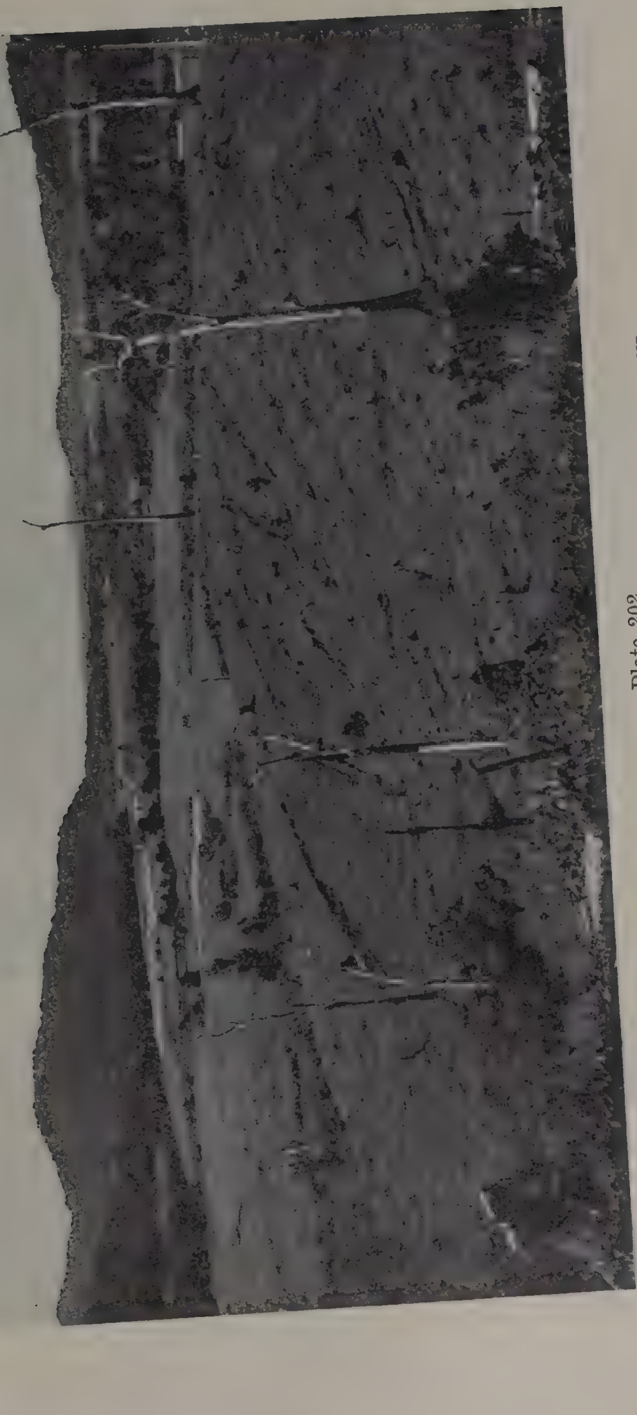


Plate 202.
In the Richly Fertile Japoon Valley, North Queensland.

2. Prepare ground thoroughly before planting so that effective cultivations and hilling can be given.

3. Cultivate and hill after every irrigation, as soon as this work can be done satisfactorily.

4. Plant deeply, not less than 4 inches from the surface.

5. Bag potatoes immediately after digging, sew the tops and invert the bags, thereby making a seal against the moth.

6. Remove the crop from the field as soon as possible after digging.

7. On no account leave potatoes exposed to the surface or in bags in the field overnight.

8. Rake and burn all potato tops after each day's harvest.

9. Sheds in which potatoes are hardened-off should be moth proof.

10. Market the potatoes as soon as possible, and only dig quantities that can be sold without delay.

11. Keep all weeds in check, particularly those likely to serve as host plants for the potato moth.

12. Practise crop rotation.

TREATMENT OF SEED MAIZE.

The difficulty often experienced in obtaining satisfactory crop stands—more particularly in the early sowings of maize because of crows and currawongs developing an appetite for germinating grain and seedling plants—can be largely overcome by adopting the undermentioned pre-seeding coal tar method of seed treatment.

The procedure is as follows:—

Warm a small quantity of coal tar slowly until it tests to a string-like horse hair consistency.

Place the seed maize in a large shallow vessel and wet it with warm water for a few minutes and then drain.

Spread over the warm moistened grain 1½ to 2 tablespoonfuls of prepared tar per bushel and stir immediately and continuously until each kernel comes in contact with the tar and assumes a sooty appearance.

Spread the grain out and expose it to dry.

The addition of a handful of sulphur to each bushel of grain will assist in a smooth run through the planter.

RED STRIPE (TOP ROT) DISEASE IN 1939.

Reports received during the current season indicate that death of cane due to top rot has been rather more prevalent than usual. Such a situation was expected to eventuate, following the generally dry conditions of last spring. Top rot is largely a seasonal disease, and is closely related to the vigour of the crop. During a dry spring and early summer the crops generally are severely checked in growth, and this condition renders them particularly susceptible to top rot with the onset of the rainy season and the commencement of rapid growth.

Generally speaking, the older and more advanced the crop the more resistant it is to top rot, and for that reason autumn-planted cane is much less liable to the disease than spring-planted cane. That is not to say that autumn-planted cane will always escape the disease; if the spring is very dry, or if the moisture-holding capacity of the soil is low, or if the cane is overcrowded, then considerable death may occur in autumn-planted cane. In general, however, the autumn-planted crops escape without very much damage.

There is, of course, a great difference in the resistance of different varieties, and S.J. 4, Badila, and P.O.J. 2878, for example, are much more susceptible than Q. 2, Q. 10, Clark's Seedling, and P.O.J. 2725. Q. 2 is, in fact, highly resistant, and damage in that variety would be rare; odd stalks will be killed, but dead stalks would be numerous only if the variety were grown alongside a badly-diseased field of a susceptible variety.

Overcrowding of stalks also increases susceptibility to top rot, and consequently it is desirable to avoid over-heavy fertilization, particularly late in the season.

Top rot is a very striking disease, and always appears to be causing more damage than is actually the case. The reason for this is that there is always a compensating increased growth of the remaining stalks; in fact, if the death takes place early, say, in January, there is really very little loss, while if death takes place as late as the end of March there is somewhere about 50 per cent. compensation.

—A.F.B., in "The Cane Growers' Quarterly Bulletin."

CANE VARIETY Q. 20 IN THE MACKAY AREA.

At the present time a new variety which was produced at the Mackay Station is undergoing yield trials on several farms in the Mackay area. It is a seedling of Badila. We are now in possession of a considerable amount of information concerning the cane, which is given the serial number Q. 20; the main features are:—

1. Moderately good yields in comparison with the standard canes of the area: appears to be superior in ratoon yield.
2. Good ratooning cane, at least when cut at favourable times.
3. Arrows rarely, and then only late and sparsely.
4. Resistant to downy mildew disease—a very important point.
5. Somewhat inclined to trash binding, but does not become badly trash bound.
6. Rather sparse foliage, calling for close planting to give better coverage.
7. Gives extraordinarily sweet and pure juices during mid-season.

The lastnamed characteristic is particularly interesting. In several juice tests it has shown purities of 95, and it is usually about 2 units better than the standard of comparison in this regard. Mill tests of 18 C.C.S. and better have been recorded.

It is not suggested that this is a cane of outstanding merit, but if observations on the existing trial plots continue to confirm present opinions, the variety will be released for general distribution in the coming spring.

—H.W.K., in "The Cane Growers' Quarterly Bulletin."

Diseases in Tomato Seed-beds.

THE following diseases may occur in tomato seed-beds in Queensland:—Irish blight, target spot, Septoria leaf spot, bacterial wilt, Fusarium wilt, bacterial canker, damping off, and possibly the virus troubles. Growers planting seed-beds at the present time, e.g., those in the Stanthorpe area, are not likely to be troubled with Irish blight, but target spot and collar rot (both of which are caused by the same fungus) may be serious.

The utmost care in managing seed-beds is always justified, for here the whole crop is concentrated into one single patch. As a result of this proximity of the plants to each other the spread of a disease is often very rapid and the effect disastrous, resulting in the loss of several weeks in planting up and the failure to catch the advantages of an early market.

There are three points during the production of tomato seedlings at which some control of diseases may be exercised:

(i.) Before planting seed, by—
- (*a*) Sterilizing the seed-bed;
- (*b*) Disinfecting the seed;

(ii.) At the time of planting, by arranging the seed in rows instead of broadcasting it;

(iii.) After emergence of the seedlings, by dusting and spraying with a fungicide.

Seed-bed.—The placing of a seed-bed on virgin soil is usually sufficient protection against soil-borne troubles other than nematodes, but if there is any doubt about this point, then sterilization should be practised. The two most suitable methods are by fire and by formalin.

Firing.—Brushwood and branches should be laid evenly over the bed and the surrounding margin. The quantity of wood required can

Plate 203.

A Fine Dairy Farm in the Making.—Rich pastures walled in by virgin rain forest, Utchee Creek land settlement area, North Queensland.

be reckoned as the equivalent of a solid layer of about 3 inches thick. The soil should be moist and neither dry nor excessively wet when firing takes place. Where wood is readily available, the fire is the cheaper method.

Formalin.—When using formalin in the seed-bed, allowance should be made for the fact that the seed cannot be planted until some twelve to fourteen days after application of the liquid. The beds are prepared ready for planting, and preferably should be moist but not wet. If the soil is dry use a 1 per cent. solution of formalin (1 gallon of commercial formalin in 100 gallons of water) and apply with a watering can at the rate of 10 gallons to the square yard. If the soil is moist, use a 2 per cent. solution of formalin watered on at the rate of not less than 5 gallons to the square yard. The beds, as soon as treated, are covered with sacking for two or three days to keep in the fumes. They are then aired for a further ten days or until the odour of formalin can no longer be detected, after which they are ready for use.

The target spot organism, which causes a black spot on the stem and may result in the seedlings suffering a collar rot just at soil level, appears to carry over in the soil. Other damping off organisms may also be present.

Seed.—Seed treatment has always been a general recommendation, though only a few growers have made a routine practice of it. In the light of recent observations, however, it is strongly recommended that all growers should treat their tomato seed with a corrosive sublimate before planting. If it is known that the seed has come from a sound, healthy crop, then treatment is not necessary. In most cases, however, the seed source is not known.

Tomato diseases shown to be carried by the seed include Irish blight, target spot, Fusarium wilt, bacterial wilt, bacterial canker, and mosaic.

It must be understood clearly that the action of this corrosive sublimate treatment is to destroy any disease producing organism which may be adhering to the outside of the seed, and so prevent the introduction of a disease into the seed-bed. It does not in any way protect the seedling against a disease which may attack it after it has emerged. A small percentage of the disease organism may be present inside the seed and so be unaffected by the treatment, but this is usually of no practical importance. In the case of bacterial wilt and bacterial canker, seed treatment is the most important method of control.

The seed treatment is summarised as follows:—

The tomato seed is placed in a piece of mosquito netting and suspended in a solution of corrosive sublimate (mercuric chloride), one part to 3,000 parts of water, for five minutes. The seed mass is stirred occasionally with a wooden stick during this period to remove air bubbles. After that it is thoroughly washed in four or five changes of water and dried. It is recommended that the seed be sown immediately after treatment. Corrosive sublimate tablets, with directions for the preparation of the solution, should be obtainable at any chemist.

Planting.—Growing conditions include many factors, of which the more obvious—such as soil tilth and sufficiency of plant foods—are well known to growers. The point for consideration here is whether the seed should be broadcast or planted in rows. In order to control disease better, the latter method is preferable. Distances of about 6 inches

between rows allow easy penetration of the dust or spray to the stems and also prevent the formation of a still, humid atmosphere beneath the leaf canopy, as is found when plants are broadcast.

Spraying.—Regular spraying or dusting with a copper compound is necessary. If using a wet spray, Bordeaux mixture of 2-3-40 strength is recommended. Care should be taken not to spray the seedlings too heavily, as an accumulation of spray liquid in the centre of the plants may result in a burning of the young foliage. In the case of dusts, any of the proprietary copper dusts may be used. Heavy applications of these dusts should not be made on seedlings if much free moisture is present on the young plants, especially if warm weather is likely to follow. Under such conditions, burning may result with either copper carbonate or copper sulphate dusts.

At various times, the grower will have to include in his spray of dust, arsenate of lead and nicotine or nicotine sulphate for insects such as caterpillars and aphids. For tomato mites, a separate dusting with sulphur is the most suitable. Dust mixtures are available which contain the various insecticides in addition to copper compounds.

TABLE BEETS.

The beet will grow well in most soils, but, like other root crops, it does best in a light loamy soil. The soils should be prepared thoroughly and enriched with liberal dressings of well-rotted stable manure or vegetable matter.

Commercial fertilizers may be used, and the Agricultural Chemist advises the following mixture:—

Sulphate of ammonia	1½ to 2 cwt.
Superphosphate	2 to 3 cwt.
Muriate of potash	¾ to 1 cwt.

A complete fertilizer, 2-12-6, also, may be used at the rate of from 4 to 6 cwt. to the acre.

The fertilizer should be applied at the time of thinning if the seed has been sown where the plants are to remain; or otherwise at the time of transplanting. A top-dressing about a month later with sulphate of ammonia at the rate of 1 to 2 cwt. to the acre would be beneficial.

As the seed is usually sown in the field, it is necessary to have the soil in a fine state of tilth prior to planting. The seed is customarily planted in rows about 2 feet 6 inches apart for horse cultivation, or 1 foot 6 inches apart for hand. Six to 8 lb. of seed is usually sufficient to plant an acre, or 1 oz. to every 150 feet. It should be sown to a depth of from ½ inch in heavy ground to 1 inch in light soil. The seed is usually slow in germinating. The distance between plants may vary from 3 to 4 inches, according to variety sown. Thorough cultivation is necessary after planting out, and until the plants are a fair size care must be taken not to injure them with the implements or heavy clods of earth.

Beets should be harvested when of suitable size for market. They are usually washed and tied in bundles of about six. Varieties recommended are—Nonpareil, which has a long oval shape; and Crimson Globe—a turnip-rooted, early beet, suitable for hot districts.

SELECTION OF BANANA SUCKERS.

In planting a new area of bananas it is advisable to make a good selection of suckers. In every banana plantation there are stools which are above the average, and it is from these that growers should select material for future plantings. Some stools are outstanding in growth and quality production. For example, they may have remained free, or nearly so, from borer attack, or they may have benefited from better soil, greater amount of moisture and other conditions in their immediate vicinity.

It is advisable for growers to mark these outstanding stools for use at planting time, noting the quality of the fruit which has been recently cut from them or which they are still bearing. This can be done by placing a stake against the selected stools or some other suitable means of easy identification at the time when planting material is required.

If by selection it is possible to produce a more open bunch of the Cavendish variety, it will be of benefit in so far that the harbourage for skin blemishing insects is lessened, that the bracts are permitted to fall more freely from the bunch, and that individual fingers fruits are more exposed to sunlight—thus ensuring uniform development of the bunch.

Plate 204.

PARK PRINCE ANXIETY IV.—Champion Hereford bull at the 1939 Brisbane Show, the property of Mr. J. Sparkes.

The Fruit Market.

J. H. GREGORY, Instructor in Fruit Packing.

DURING the last two years seasonal conditions in Queensland have alternated between prolonged dry periods and wet periods. Under these conditions, the maintainance of continuous supplies of quality fruit has been difficult.

A prolonged dry period has followed an unusually wet cold winter. With many fruits now blossoming, it is hard to accurately forecast the prospects for the coming season's crop.

Pineapple growers are still sending fruit too green.

Citrus fruits have been excellent in quality on the Brisbane market, and satisfactory price levels are being maintained.

Custard apples are in short supply and high values are being realised for good fruit.

The continuous dry weather has affected the quality of strawberry supplies.

New season mangoes and cherries will soon be coming on to the market. Mango growers are advised not to send green fruit to market as it soon depresses price levels. For the same reason, fruit which has been bruised should not be sent, also for the same reason.

The following were the ruling market prices during the last week of the month of September, 1939:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Small, 5s. 6d. to 8s. 6d.; sixes, 8s. to 10s. 6d.; sevens, 9s. to 10s. 6d.; eights and nines, 9s. to 14s. 6d.; inferior grades lower.

Sydney.—Cavendish: Sixes, 8s. to 12s.; sevens, 12s. to 15s.; eights and nines, 15s. to 18s.

Melbourne.—Cavendish: Sixes, 9s. to 11s.; sevens, 11s. to 13s.; eights and nines, 12s. to 16s.

Adelaide.—Cavendish: Sevens and eights, 20s. to 22s.

Southern markets report squirter and blackend causing losses and price reductions.

Lady's Finger, 1¾d. to 9d. per dozen.

Pineapples.

Brisbane.—Smoothleaf, 4s. to 7s. 6d. per case; loose, 1s. 6d. to 6s. per dozen; Ripley, 4s. to 7s. per case; loose, 9d. to 4s. 6d. per dozen.

Sydney.—Smoothleaf, 7s. to 10s. per tropical case.

Melbourne.—Smoothleaf, 9s. to 12s. per tropical case.

Adelaide.—Smoothleaf, 10s. to 14s. per tropical case.

Green pineapples are being sent to southern markets to the detriment of returns to growers. This practice is foolish, as it spoils the marketing of a commodity in which Queensland has a monopoly.

Papaws.

Brisbane.—Yarwun, 5s. to 8s. tropical case; Gunalda, 5s. to 6s. bushel case; locals, 3s. to 4s. 6d. bushel case.

Sydney.—4s. to 10s. tropical case.

Melbourne.—8s. to 12s. tropical case.

Custard Apples.

Brisbane.—3s. to 6s. half-bushel.

Monstera Deliciosa.

Brisbane.—6s. per dozen.

Avocados.

Brisbane.—9s. to 11s. half-bushel.

Passion Fruit.

Brisbane.—First grade, 12s. to 16s.; second, 9s. to 11s.

Sydney.—6s. to 14s.

CITRUS FRUITS.

Oranges.

Brisbane.—Small, 5s. to 8s.; choice, 9s. to 11s.

Grapefruit.

Brisbane.—6s. to 9s. bushel case.

Lemons.

Brisbane.—Locals, 7s. to 11s.; Gayndah, 10s. to 14s.

DECIDUOUS FRUITS.

Apples.

Brisbane.—Jonathan, 8s. to 14s.; Granny Smith, 8s. to 14s.; Cleopatra, 8s. to 10s.; Sturmer, 5s. to 10s.; Yates, 10s. to 14s.; Democrat, 7s. to 10s.

Pears.

Brisbane.—Winter Nelis, 9s. to 15s.; Winter Cole, 9s. to 16s.; Packham's Triumph, 9s. to 14s.; Josephine, 8s. to 15s.

OTHER FRUITS.

Tomatoes.

Brisbane.—Ripe, 4s. to 10s.; coloured, 5s. to 8s.; choice coloured, 8s. to 12s.; green, 5s. to 7s.

Sydney.—Cleveland, 8s. to 15s.

Cape Gooseberries.

Bowen, 3s. 6d. to 10s.; Yarwun, 5s. to 12s.

MISCELLANEOUS, VEGETABLES, &c.

Cucumbers.—8s. to 15s. bushel case.

Pumpkins.—4s. to 5s. bag.

Marrows.—2s. to 6s. dozen.

Lettuce.—6d. to 1s. 6d. dozen.

Cabbages.—2s. to 5s. dozen.

Cauliflowers.—6s. to 14s. dozen.

Beans.—5s. to 10s. sugar bag.

Peas.—4s. to 9s. sugar bag.

Beetroot.—3d. to 9d. bundle.

Chokos.—6d. to 9d. dozen.

Celery.—Local, 6d. to 1s. 6d. bundle. South Australian, 15s. to 17s. crate.

Rhubarb.—9d. to 1s. 3d. bundle.

CUTTING TALL-GROWING BANANAS.

The cutting of bunches of tall-growing varieties of bananas frequently presents a difficulty to growers who have not had previous experience in growing these varieties, such as Mons Marie and Lady's Finger.

The following very simple method, and one which can be worked successfully by one man is recommended:—

On the same side of the stem as that on which the bunch is hanging make two cuts with a cane knife, about 5 to 6 feet from the ground. The cuts are made one downwards and one upwards, and should meet, making an angle of about 60 degrees, approximately two-thirds of the distance through the stem, or deep enough to sever the bunch stalk in the centre of the stem. Immediately this is done, the upper portion of the stem with the bunch will not fall suddenly to the ground, but will slowly bear over, and as it gradually comes within reach the bunch is grasped and cut.

The principle of this method is that the soft fibrous tissue of the unsevered portion of the stem does not break suddenly, but because of its flexibility allows the bunch to heel over gradually. The V-shaped wedge also assists in this way: it cushions the lower and upper portions of the plant, and only gives way steadily and partly crushes under the increasing strain as the bunch nears the ground.

When cutting the stem, care should be taken to sever the bunch stalk. The tissue of this stalk is very brittle, and will snap readily. If this stalk is only partly cut, the weight of the bunch pulling the plant over will cause the unsevered portion to snap, and this sudden snapping will invariably result in the remainder of the stem also breaking and the bunch falling heavily to the ground to the detriment of the fruit.

Brisbane Show (1939) Champions.

Plate 205.

ALFA VALE NELLIE IV.—Champion butterfat cow, the property of Mr. W. H. Thompson.

Plate 206.

THE WINNING TEAM IN THE MILKING TESTS.—Left to right: Alfa Vale Nellie IV., Alfa Vale Gentle II., Alfa Vale Laura II., and Alfa Vale Model II. This group, owned by Mr. W. H. Thompson, was awarded first, second, third, and fourth places in the milking competition for aged cows.

Plate 207.
MYOLA BOSCA.—Champion Ayrshire bull, the property of Mr. R. M. Anderson.

Plate 208.
MYOLA JOY ENID.—Champion Ayrshire cow, the property of Mr. R. M. Anderson.

Plate 209.
BLACKLANDS CZAR.—Champion Australian Illawarra Shorthorn bull, the property of Mr. E. D. Lawley.

Plate 210.
SPRINGDALE NANCY XIV.—Champion Australian Illawarra Shorthorn cow, the property of Messrs. J. Phillips and Son.

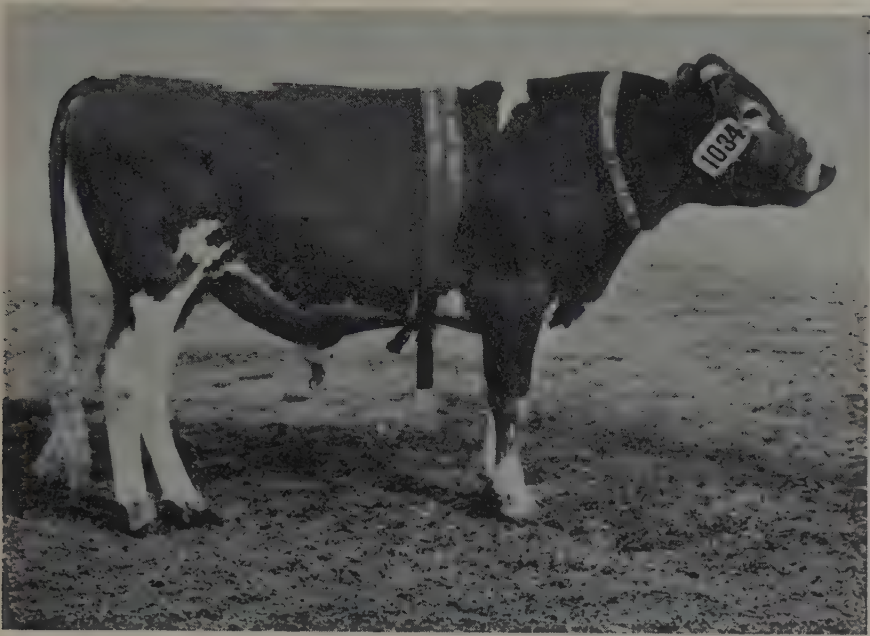


Plate 211.
Fairfield Martin.—Champion Guernsey bull, the property of Stimpsons Ltd.

Plate 212.
Laureldale Rosette.—Champion Guernsey cow, the property of Mr. W. A. Cooke.

Plate 213.

OXFORD BROWN VICTORY.—Champion Jersey bull, the property of Mrs. M. E. Stanton.

Plate 214.

GLENVIEW STARLIGHT.—Champion Jersey cow, the property of Messrs. F. P. Fowler and Son.

Plate 215.
Burnbrae Joechal Dekol.—Champion Friesian bull, the property of Mr. M. C. Pearce.

Plate 216.
Woomargama Commander.—Champion Shorthorn bull, the property of Messrs. C. P. Fairbairn and Co.

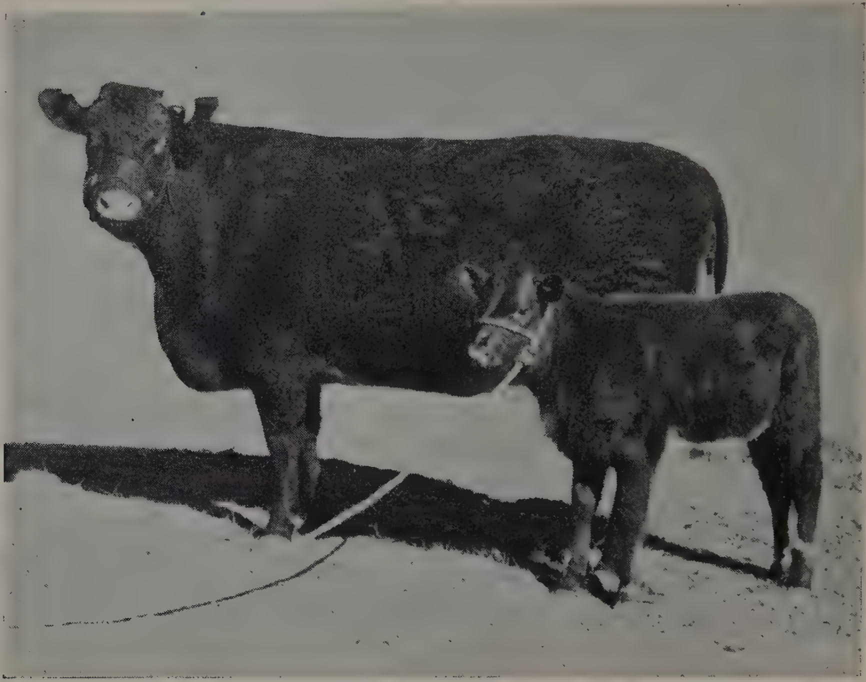


Plate 217.
NETHERBY MEADOW SWEET.—Champion Shorthorn cow, the property of Mr. J. T. Scrymgeour.

Plate 218.
ENNISVIEW OSCAR.—Hereford bull, the property of Mr. E. R. Reynolds.

Plate 219.
Myall Sunbeam II.—Champion Hereford cow, the property of Messrs. Fenwick Bros.

Plate 220.
Red Victor.—Champion Polled Shorthorn bull, the property of Mr. J. T. Scrymgeour.

Plate 221.
DEVONCOURT SNUG 1661st.—Champion Devon bull, the property of Mr. R. A. Howell.

Plate 222.
DEVONCOURT LUSTY 110V.—Champion Devon cow, the property of Mr. R. A. Howell.

Plate 223.
Abington Max II.—Champion Aberdeen Angus bull, the property of Mr. N. L. Forster.

Plate 224.
Elegosa of Ballindaloch.—Champion Aberdeen Angus cow, the property of Mr. J. M. Newman.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production charts for which were compiled during the month of August, 1939 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORN.			
	Mature Cow (Standard 350 Lb.).			
Glengarry Doris	G. Waugh, Glengarry, Peeramon	11,140·35	478·593	Sailor of Thurles
Sunnyside Empress 27th (350 days)	P. Moore, Wooroolin	12,192·6	461·874	Emblem of Sunnyside
Brunda Hilda 4th	Mrs. K. Henry, "Tara," Watts Siding	8,740·5	353·991	Karrawarra Enchanter
Navillus Nancy	E. W. Jackson, "Ennismore," Nobby	8,721·61	353·678	Midget Shiek of Westbrook
	Senior, 4 Years (Standard 330 Lb.)			
Navillus Model 5th	C. O'Sullivan, "Navillus," Ascot	9,317·4	378·397	Alfa Vale Re Nell
	Junior, 4 Years (Standard 310 Lb.)			
Rosenthal Handsome 21st	Sullivan Bros., Pittsworth	9,784·54	346·846	Rosenthal Carbine
Pilton View Ruby	P. D. Fiechtner, "Pilton View," Greenmount	7,804·3	335·864	Navillus Venie's Sheik
	Senior, 3 Years (Standard 290 Lb.)			
Menidale Thistle	H. D. Giles, Menidale, Biggenden	9,022·4	325·833	Menidale's Gentles Reflection
	Junior, 3 Years (Standard 270 Lb.)			
Cedar Grove Ivy 21st	C. O'Sullivan, Navillus, East Greenmount	7,922·48	325·966	Cedar Grove Umpire
Pilton View Lady Alice	P. D. Fiechtner, Junr., Pilton View, *via* Greenmount	7,668·00	294·992	Navillus Venie's Sheik
Sunnyside Ruby 24th	P. Moore, Wooroolin	6,537·2	277·829	Sunnyside Wongas Final

	JUNIOR, 2 YEARS (STANDARD 230 LB.)			
Glenroy Damsel	W. F. Kajewski, Glenroy, Glencoe	8,578·9	362·253	Blue Boy of Glenthorn
Glenroy Rosetta 3rd	W. F. Kajewski, Glenroy, Glencoe	8,091·2	329·782	Parkview Glider
Navillus Princess 4th	C. O'Sullivan, "Navillus," East Greenmount	8,147·68	319·606	Park View Mars
Navillus Voco	C. O' ullivan, "Narvillus," East Greenmount	7,452·46	285·807	Park View Mars
Cedar Grove Sadie	P. D. Fiechtner, Pilton View, *via* Greenmount	7,654·00	285·168	Cedargrove Umpire
Rosenthal Pendant 14th	Sullivan Bros., Pittsworth	7,858·11	282·819	Peggs Admiration
Ehlma Park May	N. Bidstrup, Warra	6,567·39	276·671	Alfa Vale Peter
Calrossie Beryl (256 days)	D. L. Lithgow, Longlands	6,556·44	247·895	Sunnyside Major
Pilton View Bonnie	P. D. Fiechtner, Pilton View, Greenmount	6,532·25	240·407	Navillus Venie's Sheik
	JERSEY.			
	MATURE COW (STANDARD 350 LB.)			
Brooklands Royal Roseleaf	W. S. Conochie, Sherwood	8,004·85	365·92	Retford Earl Victor
	SENIOR, 4 YEARS (STANDARD 330 LB.)			
Trinity Marshalls Coronada	C. W. Barlow, Spring Creek, Toowoomba	8,485·24	419·287	Trinity Field Marshall
	JUNIOR, 4 YEARS (STANDARD 310 LB.)			
Cabulcha Musty Twilight (255 days)	J. M. Newman, Caboolture	6,485·6	326·888	Pymble Twilights Paragon
	SENIOR, 3 YEARS (STANDARD 290 LB.)			
Windy Way Duchess	Wakefield Bros., Upper Barron, Atherton	6,223·00	346·542	Royal Emblem 2nd of Rosedale
	JUNIOR, 3 YEARS (STANDARD 270 LB.)			
Tecoma Dove	W. Semgreen, Tecoma, Coolabunia	6,470·7	350·111	Bruce of Inverlaw (Twin)
Trinity Bright Girl	G. A. Champney, Wooroolin	7,876·25	438·694	Trinity Noble Born
	SENIOR, 2 YEARS (STANDARD 250 LB.)			
Westbrook Safety 16th (258 days)	Farm Home for Boys, Westbrook	5,539·75	317·569	Oxford Golden Dreamer
Windy Way Melba	Wakefield Bros., Upper Barron, Atherton	4,343·85	282·99	Royal Emblem 2nd of Rosedale
	JUNIOR, 2 YEARS (STANDARD 230 LB.)			
Bellgarth Countess	D. R. Hutton, Bellgarth, Cunningham	5,784·21	324·52	Trecarne Renown II.
Inverlaw Mable	R. J. Crawford, Inverlaw, Kingaroy	6,491·49	320·877	Oxford Royal Lad
Bellgarth Charm	D. R. Hutton, Bellgarth, Cunningham	6,223·31	316·009	Bellgarth Thornhope
Oxford Betty VI.	E. Burton and Sons, Wanora	4,942·25	260·513	Oxford Peer
Oxford Sylvie 3rd	E. Burton and Sons, Wanora	4,918·05	248·921	Oxford Peer

General Notes

Staff Changes and Appointments.

Mr. D. O. Atherton, B.Sc., M.Sc.Agric., Assistant Research Officer, has been appointed research officer, Entomological Section, Division of Plant Industry (Research), Department of Agriculture and Stock. Mr. Atherton is stationed at Toowoomba.

Messrs. R. D. R. Rex and C. M. Martin, assistant cane testers, have been transferred from Bingera Mill to Marian Mill, and from Marian Mill to Bingera Mill, respectively.

Mr. E. H. Baker, clerk of petty sessions, Childers, has been appointed chairman of the Isis Local Sugar Cane Prices Board, and an agent of the Central Sugar Cane Prices Board for the purposes of Section 5 (2A) of the Regulation of Sugar Cane Prices Acts, in place of Mr. V. J. Anderson, who has relinquished the position of acting clerk of petty sessions at Childers.

Mr. A. J. Cork, "Bellaringa," via Jackson, has been appointed an honorary protector of fauna and an honorary ranger for native plants.

Mr. A. C. A. Rayner (Union street, Maryborough) has been appointed an honorary protector under "*The Fauna Protection Act of* 1937."

Messrs. C. Brown (of the Enoggera Golf Club) and D. J. Wilson (West End) have been appointed honorary protectors under the Fauna Protection Act and honorary rangers under the Native Plants Protection Act.

Mr. C. J. F. Swinburne, instructor in sheep and wool, Department of Agriculture and Stock, has been transferred from Brisbane to Blackall.

Mr. A. P. Hansen (Seaforth, Kuttabul) and Mr. G. H. Miers (Springcliffe, Kuttabul) have been appointed honorary protectors under "*The Fauna Protection Act of* 1937."

Mr. A. C. Ward (Gloucester street, South Brisbane) has been appointed an honorary protector under the Fauna Protection Act and an honorary ranger under the Native Plants Protection Act.

Mr. W. A. G. Haylett, inspector of stock, slaughter-houses, and dairies, has been transferred from Brisbane to Toowoomba.

Banana Industry Protection Board.

A Regulation has been issued under the Banana Industry Protection Acts providing that for the period until 30th September, 1940, the two growers' representatives on the Banana Industry Protection Board, in lieu of election, shall be nominated by the Committee of Direction of Fruit Marketing from the Banana Sectional Group Committee.

Messrs. W. J. Branch (Russell Island) and A. W. Chapman (Eumundi) have been appointed growers' representatives on the Banana Industry Protection Board until 30th September, 1940.

Millaquin Mill Levy.

Regulations have been issued under "*The Primary Producers' Organisation and Marketing Acts,* 1926 *to* 1938," empowering the Millaquin mill suppliers' committee to make a levy at the rate of one half-penny per ton on all sugar-cane loaded at the Yandaran railway siding, the proceeds from such levy to be used for administrative purposes by the Yandaran canegrowers' branch of the Millaquin mill suppliers' committee.

Wild Life Preservation.

An Order in Council has been issued under "*The Fauna Protection Act of* 1937" declaring "Bellaringa" (the property of Mr. A. J. Cork, via Jackson), to be a sanctuary under such Act.

An Order in Council has been issued under "*The Fauna Protection Act of* 1937" declaring portion of North Toolburra, near Warwick, the property of Messrs. R. E. and S. Rankin, to be a sanctuary under the Act.

Central Sugar Cane Prices Board.

The Regulations under the Regulation of Sugar Cane Prices Acts have been amended to provide for preferential voting in connection with the election of the canegrowers' representative on the Central Sugar Cane Prices Board.

Sugar Experiment Stations.

Executive approval has been given to the issue of an Order in Council under "*The Sugar Experiment Stations Acts*, 1900 *to* 1938," providing that notification of the appearance of disease shall apply only in respect of the areas to which it is from time to time made applicable by proclamation.

A number of proclamations have also been approved under such Acts, covering—

- The declaration of diseases and insects;
- The removal of sugar-cane;
- The removal, planting, or transplanting of sugar-cane plants in the parishes of Sophia, Grafton, and Trinity, Mulgrave Mill area;
- The introduction of sugar-cane into the Isis Mill area;
- The Bundaberg-Childers district quarantine area;
- The removal of cane plants from the parishes of Maryborough, Tinana, Bidwell, Walliebum, and Young; and
- The notification of Fiji disease and downy mildew in the Bundaberg-Childers District Quarantine Area.

The issue of the abovementioned Order in Council and proclamations is consequential on the passing of "*The Sugar Experiment Stations Acts Amendment Act of* 1938," and, further, all previous regulations in force under the Acts have been rescinded, and new regulations to give effect to the requirements of the amended Acts have been approved to-day.

These, amongst other things, provide for the appointment of inspectors under the Acts who may seize and detain any sugar-cane suspected to be diseased which is being introduced into Queensland or removed from one part of the State to another, and may also inspect any land or premises where sugar-cane is grown or kept. The officers of the Bureau of Sugar Experiment Stations have been appointed inspectors under the Acts.

Trans-Border Stock Crossings at Killarney.

Because of the reinfestation by ticks of the Woodenbong area of New South Wales, it has been found necessary to issue an Order in Council under the Diseases in Stock Acts prohibiting the introduction into Queensland of any cattle or horses from New South Wales through the crossing place at Killarney, unless such cattle or horses are provided with a certificate of health and freedom from ticks, and unless they are found to be clean on inspection at the crossing place and are dipped or hand-dressed at Killarney.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of Mr. W. D. Francis, Botanist.

Red Natal Grass.

P.R. (Pittsworth)—

The specimen is Red Natal grass, *Rhynchelytrum repens.* It was introduced into Australia many years ago as a fodder grass, and has since become widely spread in coastal and subcoastal Queensland. The grass did not sustain its reputation as a fodder, cattle showing little taste for it. It usually occurs as a weed of fallow land, along roadsides, cultivation headlands, railway cuttings, and anywhere the ground has been disturbed. It has the further disadvantage of being shallow-rooting. So far as we know, there has been no grazing experience with the grass on the Downs. One method which has been used on a small scale to utilise the grass as a fodder was to mow it, and stack it, and then mix it with more palatable cultivated fodders and make it into a chop-chop, which horses are reputed to be fond of.

Groundsel.

J.H.A. (Miva)—

The specimen is groundsel bush (*Baccharis halimofolia*), a native of South America. This plant has become a great pest, especially in parts near the coast along salt-water and brackish creeks. It has spread over a very large area of the coastal country. It is of very little feed value for stock, but is not known to be poisonous. As it is such a pest, it is advisable to eradicate it before it gains a hold.

Ball Nut.

Inquirer (Brisbane)—

The nut is an immature specimen of the ball nut (*Macadamia praealta*). It is a native product of the rain forests of Eastern Australia from the Clarence River in New South Wales to as far north as Gympie in Queensland. According to Rumsey, a nurseryman in New South Wales, this nut is worth growing for its edible properties. However, we have not known it to be eaten. As its botanical name implies, it is related to the Queensland nut (*Macadamia ternifolia*). It is a tree attaining a height of about 60 feet, and a stem diameter of about 1 foot.

A Tick Trefoil.

J.D.O'B. (El Arish, North Queensland)—

The specimen is, as you suspect, a tick trefoil, and is known botanically as *Desmodium triflorum.* It is common in the pastures from the border of New South Wales right up to Cairns. It is considered to be a good fodder, and has the advantage of being a leguminous plant. However, it is so short and grows so closely to the ground, that it does not provide much head as fodder for dairy stock.

Sensitive Plant.

K.E.A. (Kwato, Samarai, Papua)—

Your specimen is the sensitive plant (*Mimosa pudica*). This species is not a bad pest in Queensland. Where hoeing is impracticable, noxious weeds here are sprayed with arsenical sprays, or preparations such as Weedex.

Blue Pincushion, Spur Velleia, Cape Weed.

H.W.B. (Eulo)—

1. Blue pincushion, *Brunonia australis.*
2. Spur velleia, *Valleia paradoxa.*
3. Cape weed, *Cryptostemma calendulacea.*

Nos. 1 and 2 are native plants. They are not known to be harmful to stock.

No. 3 is a native of South Africa. It is a common weed in New South Wales and southern parts of Queensland. This plant is not known to possess any poisonous properties. In New South Wales and Victoria, it is sometimes reputed to be a fairly good fodder, but the plants mostly observed in this State do not appear to be eaten by stock to any great extent. Although this plant has been present in Queensland for many years, it has not become a very serious pest. One objection to it, however, is that it covers the country to the exclusion of grasses and other herbage, and leaves large areas devoid of feed when it dies down in the summer months.

A Reputedly Poisonous Weed.

M.K. (Brisbane)—

The specimens represent *Solanum Seaforthianum,* a native of tropical America. At different times we have received reports that children have become violently ill after eating the berries. The berries also have been, at times, stated to be poisonous to poultry. Otherwise, we have no definite evidence of their poisonous properties. This plant is now very common as a weed in some of the drier rain forests of the coast.

White Horehound.

J.R. (Laidley)—

The weed specimen looks like the common white horehound (*Marrubium vulgare*). This is a native of Europe, and it a common weed on the Darling Downs. This plant is used in medicine and in the preparation of beverages. Extracts made from it have tonic and stimulating properties. The best method of eradication is by hoeing, or ploughing in before the plant seeds.

A Milk-tainting Plant.

M.D.O'D. (Lowood)—

The specimen is from *Rivina lævis,* a weak undershrub and a native of South America. As you remark, it causes a bad taint in milk and cream. We have not heard a distinctive local name applied to it.

Plants from Lockyer District Named.

T.L.M. (Laidley)—

1. *Nicandra physalodes,* Apple of Peru. Garden plant grown for its flowers and peculiar fruit; rarely touched by stock; not known to be poisonous. It is closely allied to the Cape gooseberry.

2. Your "plant with the little stars which form the seed" is *Acanthospermum hispidum,* Star burr. It is a native of Brazil. This burr is spreading in Southern Queensland. It is not known to be poisonous.

3. The two pods belong to *Cajanus indicus,* Pigeon Pea, a native of India. The young pods may be used as a vegetable in the same way as French beans.

Carpet grass or mat grass is a menace to good pastures, although it may be valuable on second-class country. It is not known to cause any flavour in cream, but in good pastures, such as paspalum pastures in the more fertile coastal regions, the cream supply is greatly reduced when mat grass replaces paspalum.

A Common Tropical Plant.

S.E.S. (Cairns)—

The specimen is *Pterocaulon glandulosum*, for which we have not heard a common name. It is a common plant in the tropics of Australia, and is not known to be poisonous to stock. It is used by aborigines to apply to spear wounds as a healing agent.

Shrubs Suitable for the Fassifern District.

P.B.N. (Harrisville)—

Suitable shrubs are: *Ligustrum ovalifolium*, *Ligustrum chinense*, the Oleander (*Nerium Oleander*), *Tecoma stans*, and the various kinds of *Legerstroemia* which are referred to as "Pride of India."

The two species of *Ligustrum* form very dense, shapely shrubs with small white flowers. The other shrubs in the list are conspicuous for their bright flowers. Most nurserymen stock them.

Emu Grass. Darnel.

W.B. (Warra)—

The plant with the small, finger-like leaves is a native legume, sometimes called Emu grass. It is known botanically as *Psoralea tenax*, and is a good fodder plant.

The grass specimen is commonly known as darnel or drake. Its botanical name is *Lolium temulentum*. It is a native of Europe and Asia. It is an annual, and is relished by stock. The seed, however, contains a narcotic poison, and because of this it should not be encouraged to grow abundantly.

Wild Tobacco.

H.F.M. (Dayboro)—

The plant is the wild tobacco, *Solanum auriculatum*, a native of tropical America. It is a common pest of coastal scrub lands. It is very difficult to eradicate by brushing, as it shoots repeatedly, but after a period of years it usually dies out soon after it attains full development, when it has become a tall shrub or small tree.

Tape Vine.

A.J.F. (Upper Nerang)—

The specimen is the tape vine, *Stephania hernandiæfolia*. This plant has been reported as poisonous, but in feeding tests at Yeerongpilly by the Poison Plants Committee of the Department of Agriculture and Stock negative results were obtained in all cases. The committee now considers that the plant may be regarded as non-poisonous.

The tape vine belongs to a family of which some members are very poisonous. Notable among plants of this family are some species which provide the most active ingredients for the arrow poisons or curare of certain Indian tribes of South America. In these cases, however, the toxic principle is effective when it comes in contact with wounds.

Some Trees of Inland Regions.

W. (Toowoomba)—

The emu apple is common along the western line as far as Roma. We have seen good specimens of the tree in the Tara and Chinchilla districts. As it is a very well-known tree, some of the farmers of those districts would be in the best position to obtain seeds for you.

The wilga also is a very common species from Dalby, around Tara, and westwards to Charleville. The myall is common in districts from Dalby to Roma. The belah is one of the commonest trees in the Tara district.

It is suggested that seeds of these trees may be obtainable from residents of the districts mentioned.

Rural Topics

Beekeeping and Defence.

Beekeepers may have to play an important part in the defence of Australia, it was stated at a conference of beefarmers in Sydney recently.

It was said that "without sufficient bees to properly pollinate plants, agricultural and horticultural interests in Australia would be greatly handicapped.

"If Queensland got into difficulties and we were cut off from our sugar-producing areas, other States would have to depend on honey production for sweetening for many purposes."

During the Great War, it was said that a "Digger" was offered fifteen shillings for a 2-lb. tin of honey sent to him in a parcel from Australia, so keen was the demand for it.

The Danish Farmer's Example.

This is what a farmer, who knows Denmark and the Danes well, said recently:—

> "The explanation why Danish farmers are the most prosperous in the world is simply this:—They produce, manufacture, finance, and market their own products. They produce directly, but they finance, manufacture, and market by proxy through their own co-operative organisations; and there is no other way out for the farmer in any land or country."

Milk and Beauty.

In Hollywood, that fabulous beauty centre, milk is now regarded as an indispensable aid to health. Famous "film stars" drink it in their dressing rooms, studio restaurants use thousands of quarts every day, and a milk truck goes along "on location." Efficient distribution of safe, dependable milk is accepted as a vital daily factor wherever beauty and health are watchwords.

Beware of the Quiet Bull.

It is a common news item that tells of somebody being badly hurt by a vicious bull. Usually the bull was not considered vicious—it was trusted, hence the trouble. No one ever hears of a vicious bull hurting anybody, for the simple reason that as he is known to be vicious he is not trusted. So therefore it is wise to beware of the quiet bull, especially the Jersey.

Our Greatest Farm Workers.

The enormous amount of work a dairy cow is called on to do makes their care and attention the important problem that it is. Cows do more work, everything considered, than any of the other farm animals, for in addition to the production of large quantities of milk they must also reproduce their kind every year. This may be one of the reasons why the cow is provided with the capacity for the consumption of such large quantities of feed. Good feeding, adequate shelter, constant attention to their health, wellbeing, and comfort are all necessary if the best results are to be obtained from the cow.

Milk in Industry.

Here are some remarkable figures from a report of the National Milk Publicity Council in England. During one month workers in factories, mines, workshops, and offices consumed 708,273 gallons of milk. The figures are nearly double those of twelve months earlier. At the present rate of consumption the milk scheme in England is increasing liquid milk sales by nearly 8,500,000 gallons a year.

A Real Live Scare Crow.

A Texas farmer claims that he has successfully kept his crops free from crows by catching one alive, and then letting it go with a small bell attached to its neck. The belled bird, in trying to rejoin its flock, scares all the other crows away, but remains in the vicinity itself.

"Blood Lines" in Dairy Cattle.

This year an important work is being undertaken by the Council for Scientific and Industrial Research, and that is the investigation of "blood lines" in dairy cattle in order to discover the effect on production levels by the introduction of new blood. A start has been made with a study of the Jersey breed in Australia.

Every breed of animal has within it many blood lines, some of which have been intensified more than others. Production levels vary, sometimes as the result of better feeding, and sometimes as the result of new blood. Before these trends can be attributed to particular blood lines, however, it is necessary first to analyse the pedigrees, not only of individuals but of the breed as a whole, and to find out all about the influences of in-breeding and everything else associated with these trends.

Mastitis Control.

Queensland dairy farmers will be interested in the trying out of a German method for the treatment of mastitis at the Glenfield Stock Experiment Station in New South Wales. The method attacks the disease direct. and results so far have been very successful. After treatment, it was noticed that the milk of affected animals returns to normal. The treatment, of course, cannot yet be recommended for general use, but it looks as though the method may eventually prove of great value to the dairy industry.

Grand Opera in the Milking Shed.

Here is something more about the effect of music on cows at milking time. A well-known operatic singer has accepted an invitation to go to the Walker-Gordon Farms, New Jersey, to enable a study to be made by noted psychologists of the effect of her singing voice on the milk production of the 2,000 cows of the institution. A number of other celebrities will assist in the experiment to determine just what kind of music the cows like best.

There is a suggestion in that for our own budding Melbas and Carusos to soothe their favourite cows with song. "It's Better to Fill the Bucket than Kick the Bucket" might well be the first number of a cow yard concert. And think of the economic possibilities of reviving the old farm home ballad—"The Cows are in the Corn," in the dewdamp fragrant morn! This year's phenomenal cream cheque for Queensland may reach ten million pounds (£10,000,000) in hard, cold cash. Think of the prospect of doubling that sum with softly warbled lyrics or recorded musical gems.

No doubt, the result of that operatic experiment will be awaited with widespread interest.

Overspeeding in Shearing.

Ways and means of bringing about better shearing are being discussed in southern pastoral districts. An authority in the wool industry says that "the chief enemy of shearing sheep properly is speed. The shearers can shear the sheep well, but they cannot shear well if they go too fast." This authority points out that each shearer has his top point, beyond which his work becomes faulty. His opinion is that the man who can shear 100 sheep a day well may shear 120 a day badly, and the man who can shear 140 a day well will shear 160 a day badly.

Grass as a Lightning Conductor.

Without grass all animal life would speedily go into a decline. We, ourselves, would soon find the earth uninhabitable if no grass grew.

Carpets of grass keep the earth warm in winter. In summer, grass tempers the heat, absorbing into its blades so much of the sun's power as to make the atmosphere tolerable to us, and at the same time its dense mass of roots keeps the earth beneath from becoming overheated.

Nightly respiration of grass gives back a vast amount of vapour into the air to help to counteract the drying effect of the previous day's sun, while all day long grass is absorbing poisonous carbonic acid gas and discharging the oxygen we breathe. Every upstanding blade of grass is a lightning conductor, and whenever there is a thunderstorm much of the lightning is attracted to the growing grass and conveyed harmlessly to mother earth.

Oranges on the Ice.

A process for the chilling of navel orange slices which retains the flavour, colour, and firmness of the orange indefinitely under refrigeration has been patented and is now being successfully developed in California. The fruit is peeled, sliced, and placed in glass jars of varying capacities. The jars are then filled with the required amount of honey and lemon syrup, prepared according to formula, and placed in freezing rooms until moved to market.

Storing Maize on Its Feet.

A new way of storing maize for stock food has been brought under notice. The idea was evolved by a farmer at Kurrajong, in New South Wales. After filling four pit silos with chaffed maize, he had 30 or 40 tons over. This surplus he cut green, the grain being in the milky stage, carted it in without losing any time and without drying, and stood it on its feet in a shed. To keep the stalks upright, and to allow for a current of air to pass through the stack, poles were placed every 2 feet as the shed was being filled. Consequently, there was no heating, and there was a complete absence of mould—the maize simply curing like hay, retaining all the leaf and much of its succulence.

About three months after it was stored it was chaffed with some sorghum, and a little bran and pollard was added to the ration. When fed to the dairy herd, results turned out remarkably well and the cows maintained their milk production better than they had done with any other sort of feed the farmer had tried.

On these results, this method of storing green maize is regarded as much better than trying to make hay with it by drying it in the field, or attempting to make stack ensilage with it, as, when treated in either way, considerable waste occurs, and the quality of the material is definitely inferior than when it is stored "standing on its feet" in the shed.

The success of this method depends entirely on placing the stalks upright and providing plenty of space for air movement, so that no heating or mould will occur. As it requires only a simple roof overhead, it is a cheap way of storing green maize in the stalk, especially as its feeding value, when so treated, is maintained.

What a Good Editor Ought to be.

A good editor is one who has never made a mistake; who has never offended anyone; who is always right; who can ride two horses at the same time he is straddling a fence with both ears to the ground; who always says the right thing at the right time; who always picks the right horse to win; who never has to apologise; who has no enemies, and who has worlds of prestige with all classes, creeds, and races. There never has been a good editor.—*Minnesota Press (U.S.A.)*.

Pure Wool Wanted.

Dr. Clunies Ross, the Australian representative on the International Wool Secretariat, who was recently in the United States, says that he found there a growing resistance to the use of wool substitutes. The American people still associate quality with wool and are becoming increasingly conscious of the need for asking for, and insisting on getting, wool when it is for wool they are paying.

Australia's Wettest and Driest Regions.

The wettest known part of Australia is on the north-east coast of Queensland, between Port Douglas and Cardwell, where three stations situated on or adjacent to the Johnstone and Russell Rivers have an average annual rainfall of between 142 and 165 inches. The maximum and minimum falls there are: Goondi, 241.53 inches in 1894 and 67.88 inches in 1915, or a range of 173.65 inches; Innisfail, 211.24 inches in 1894 and 69.87 inches in 1902, or a range of 141.37 inches; Harvey Creek, 254.77 inches in 1921 and 80.47 inches in 1902, or a range of 174.30 inches. The driest known part of the continent is in the Lake Eyre district in South Australia (the only part of the continent below sea level), where the average rainfall is only 5 inches, and where the fall rarely exceeds 10 inches for the twelve months.

A New Product of Lactic Acid.

The United States Bureau of Dairy Industry has perfected a process for making a transparent rubber-like substance from lactic acid of whey, which has many promising uses in various industrial operations. Fabrics, paper, and other fibrous materials may be coated with this substance to make them more or less waterproof, as well as resistant to oil and grease.

Dairy Keeping with a Tin Opener.

We've all heard of the untrained housewife who keeps the dinner table going with a tin opener as the most used kitchen implement. And now we learn that canned grass, for winter eating, is the newest addition to the American cow's bill of fare. The "cans" are 8 feet in diameter and 25 feet high, and are made of boiler iron. Freshly-mown grass is pushed through a silage-cutter, and dry ice is mixed with it as it goes into the cans. The ice cools the grass, changes to gas, drives out the air, and stops fermentation. Sliding, rubber-edged tops settle down with the grass and allow the air to escape around their edges, but prevent entrance of outside air. The 65 lb. of dry ice required for each ton of grass costs about 6d. 6d. in our money.

How to Bluff that Crowing Rooster.

If crowing troubles anyone's sleep, there is a way of silencing him permanently without using an axe. In London, the British Noise Abatement League recently turned its attention to muffling the thousands of noisy roosters in the city suburbs. Someone thought of stretching a heavy cloth canopy low over their roosts. Now, whenever the birds stretch their necks to crow, they hit their heads against the cloth and pipe down.

Hay for the Calf.

Plenty of good hay is the secret of successful calf-rearing, according to a well-known New Zealand dairy farmer, and he condemns the use of inferior fodder. Too often, he said, young stock are left to fend for themselves on roughage with an irregular ration of bad hay. That is an unprofitable practice, for the reason that the treatment given to heifers, especially heifers in calf, and the value of their winter feed contributes to a great extent towards developing good dairy qualities in the animals. Properly fed heifers usually develop into very profitable dairy cows.

A Silo Built of Straw.

What is believed to be the first straw silo in Australia has been built on a grazing property just below the border.

Straw silos have been in use in the United States for some time, and, with the present revival of interest in silage-making in Queensland, there is some talk of the idea catching on well here.

The way it is built is simple. Bales of straw are used. Each ring of straw bales—it is circular in construction—has a No. 8 wire strained round it to keep it in place. The round straw wall may be built as high as 25 feet. The straw silo on the property mentioned is being filled with lucerne, which is allowed to cure for five or six days before being placed within the straw walls of the silo. As each tier of straw is placed in position, the silo is filled to the top; and so on, until both the silo and filling are completed. The elevator used is home-made, and costs about £25 for material.

A neighbouring grazier, impressed with the cheapness and effectiveness of a straw silo, plans to build one also, but he proposes to make the walls of banana-shaped bales, bound with wire and piled 20 feet high. The silo will be filled with chopped greenstuff delivered by a blower, adding molasses at the rate of 4 lb. a cwt.

Better Butter.

Every dairy farmer is directly interested in the discussions at the recent butter factory managers' conference in Brisbane. Maintenance of the good name of the Australian dairy industry, and, incidentally, the obtaining of a better price for our exported butter, depends, in the first instance, on the proper handling of cream. Cream which can rightly be graded as choicest is the first thing in the production of butter which now rivals the world's best. Correct grading and skilful manufacturing are also of greatest importance. Packing, finish, and general appearance are also very important factors in butter-marketing. "Nothing but the best" is the slogan which, if what it implies is applied, will mean not only maintenance of Australia's reputation abroad, but better business and bigger returns for our butter exports.

According to Sir Geoffrey Whiskard, British High Commissioner in Australia, "the time is past when Australia can find an ample market for everything and anything she produces; markets are now restricted, and primary producers must concentrate more and more on quality in the face of strong competition."

Limewash which Lasts.

Common limewash, made by slaking freshly burnt lime and diluting it with water, is often found to be friable when dry, and rubs or flakes off rather easily. Effort has, therefore, long been directed to the discovery of a method of preparation which will make the coating more resistant to rubbing, less liable to flake off, and having some waterproofing qualities.

At the start, it should be said that a good deal of the flaking which occurs is due to new coats being put over previous applications which are practically already detached from their base, and merely require the slight "pull" caused by a succeeding coat to cause them to break. There is no known way of overcoming this condition other than removal by washing or scraping of the defective coating.

Ordinary limewash is made by slaking about 10 lb. of quicklime with 2 gallons of water. As an ordinary fixative, alum, 1 oz. to the gallon, will stop whitewash from rubbing off easily.

Flour Paste.

Alternatively, the addition of flour paste, which, however, needs the further addition of zinc sulphate as a preservative to prevent mildew, may be tried.

A reliable recipe for interior use (walls, ceilings, &c.) is:—

(*a*) 62 lb. (1 bushel) quicklime, slake with 15 gallons of water, and cover with sacking till steam ceases to rise. Stir occasionally to prevent scorching.

(*b*) 2½ lb. flour, beat up in ½ gallon cold water, then add 2 gallons boiling water.

(*c*) 2½ lb. common rock salt dissolved in 2½ gallons hot water.

Mix (*b*) and (*c*), then pour into (*a*) and stir until well mixed. This produces a mixture of good brushing consistency, and is used in factories, being recommended to prevent easy ignition.

Where a weatherproof coating for use out-of-doors is required, the following is a recipe which should prove satisfactory:—

Place 1 bushel of good fresh quicklime in a barrel with 20 lb. of beef tallow, slake with hot water (about 15 gallons added gradually so as not to "drown" the lime) and cover with sacking to keep in steam. When the lime has slaked the tallow will have disappeared, having formed a chemical compound with the lime. Dry earth colours (ochre, sienna, &c.) may be added before slaking if a cream or buff tint is desired. The mixture should be stirred occasionally, and thinned to easy-flowing consistency with clear water when cold.

"Lighthouse" whitewash, again suitable for exterior purposes and used for coastguard buildings, is made in the following way:—

(*a*) 62 lb. (1 bushel) quicklime, slake with 12 gallons hot water;

(*b*) 12 lb. rock salt, dissolve in 6 gallons boiling water;

(*c*) 6 lb. Portland cement.

Pour (*b*) into (*a*) and then stir in (*c*) and use at once.

Skimmed milk used in place of diluting water is sometimes advocated to increase the tenacity of the wash, and an old recipe for external colouring of farm buildings is:—Lime ½ bushel slaked with 1 gallon of milk and remainder of water; 1 lb. salt, ½ lb. zinc sulphate to withstand weather.

It has been found that an old cobwebby roof not easily accessible to brushing can be effectively cleaned by machine-spraying with common limewash (well strained) which will bring the dust and cobwebs down, so that a second application produces a reasonably clean, white finish.

—*Edwin Gunn in "The Farmer and Stockbreeder" (England).*

Oranges as Cow Feed!

Oranges can be fed to cows, not only as an occasional "shout," but as a staple diet. This claim is made by science workers at the Jewish Agricultural Experiment Station in Palestine. The object of the experiments is not only to improve the dietary of milking cows, but also to make use of surplus oranges which cannot be exported.

The investigators do not mention, however, whether the cows produce milk with an orange flavour. If they do, they'll soon win wide popularity as mobile milk bars! The possibility of other fruit flavours in the morning milk are infinite.

Farm Notes

NOVEMBER.

Wheat-harvesting will become general in November, and now is the time to see that all field equipment—header-harvesters, tractors and other machinery—is in thorough working order. All working parts should be oiled and examined and necessary readjustments made in order to avoid the risk of stoppages in busy times.

Rust is not the menace that it used to be, now that more or less rust-resistant varieties are in general cultivation. Three Seas and Seafoam wheats are moderately resistant, while other varieties—such as Flora and Florence—usually ripen early enough to escape rust.

November is regarded as the best time for the establishment of the main maize crop, because the tasselling period coincides usually with normal summer rains. Too much attention cannot be given to the preparation of land for maize, which should now be well advanced, for no amount of inter-row cultivation will overcome the retarding influence of faulty initial preparation. Inter-row cultivation should become progressively shallower as growth proceeds, and may be discontinued at the cobbing stage.

Increased attention is being given to the growing of grain sorghums, chiefly in districts where the rainfall is insufficient to assure profitable yields from maize. Instances are known of yields up to 12 bags to the acre being obtained under conditions which were fatal to maize, while the capacity of header-harvesters to deal with the new dwarf-growing varieties is a big factor in economical production.

For intermediate crops, the rapidly maturing millets, Japanese millet and white panicum, can be recommended for present sowing, being suitable for grazing, silage, or hay. If seed production is desired, preference should be given to the variety known as Giant Panicum or Giant Setaria, and to the French millet.

Local potatoes and onions will now be arriving on the market, and, in order to obtain the best possible returns, attention should be given to grading, and to marketing produce in good, clean bags.

To retard infestation by the potato tuber moth, the potatoes should be bagged and removed from the field without delay, as, if exposed overnight, some infestation may occur during storage.

The planting of peanuts will be continued in the main South Burnett districts, where Virginia Bunch and Red Spanish are the principal varieties grown. Growers are reminded of the better germination obtained where seed is treated with a fungicide before sowing.

In addition to the crops mentioned, seasonal sowings of Sudan grass, broom millet, buckwheat, pumpkins, and melons can be made, and cow cane and sweet potatoes planted out.

Where broom millet is grown as a side-line, it is sometimes preferable to make small successive sowings in order to spread the harvesting over a longer period.

Orchard Notes

THE COASTAL DISTRICTS.

Citrus Fruits.

In the citrus orchard increasing temperature and the possibility of a dry period call for the utmost attention to soil conditions, particularly aeration and moisture conservation. At the slightest sign of distress because of lack of moisture, trees should be irrigated thoroughly whenever water is available. At the same time attention should be given to cultivation, particularly on hillside orchards. In the coastal districts the possibility of the approach of storms will prompt growers to consider the completion of each cultivation by forming shallow drains for running off excess water and preventing soil losses.

The incidence of mites, which are the direct cause of the darkening of the skin of the fruit, a condition known as "Maori disease," is another matter for observation. Usually the first indication of the trouble is when, with the sun shining on it, the fruit has the appearance of being covered with a grey dust. If examined with a good lens, the skin will be seen to be covered with numerous yellow slug-like insects which are living on the skin.

Under certain weather conditions scale movement may be expected.

Detailed information regarding insect control may be obtained from departmental publications on the subject.

Pineapples.

Continue planting pineapples as discussed in these notes last month, always remembering that the modern practice is smaller areas, close planting with more pineapples to the acre, quicker, better and healthier growth, and finally better fruit by liberal fertilizing through the leaf bases with 10-6-10. Collectively, these practices tend towards the elimination of wilt.

Bananas.

New Plantings.—November and December are very suitable planting months in most districts. Just as modern methods have brought about great improvements in pineapple culture, so they might be applied in principle to banana-growing. Smaller areas and large production per acre should cut overhead costs, lighten labour, lengthen the profitable life of the plantation, and reduce the time of waiting for the crop. To this end, select planting material with care, plant in large holes, and break up the ground as soon as possible after planting. To prevent the loss of top soil by erosion and to provide the bananas with a cooler and moister environment, plant a cover crop as soon as the weather permits and initial weed growth has been suppressed. This will hold the loose surface soil during the summer rains.

Young Plantations.—The correct follower or followers for each plant should be selected, if not already done, and all additional suckers suppressed. Cultivate to conserve moisture, and mulch with a cover crop. A complete fertilizer will improve the coming crop.

Old Plantations.—De-sucker to one follower to each plant. Apply a complete fertilizer, if not already done, and cultivate to conserve moisture.

General.—Bait for borers; be prepared for caterpillar plagues; watch for bunchy top.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

KEEP the orchards and vineyards in a thorough state of cultivation, so as to keep down all weed growth and conserve moisture in the soil. This is important, for if a long spell of dry weather sets in, the crop of summer fruit will suffer severely from the lack of moisture. Citrus trees should be irrigated where necessary, and the land kept in a state of perfect tilth. Spraying for codling moth should be continued, and all pip fruit trees should be bandaged by the beginning of the month; further, the bandages should be examined at frequent intervals and all larvæ contained in them destroyed. The neglect to spray thoroughly and to attend to the bandages properly is a cause of the increase in this serious pest in the Granite Belt, and growers are warned that they should pay more attention to the destruction of this pest if they wish to grow pip fruit profitably. Fruit fly may make its appearance in the cherry crop; if so, every effort should be made to stamp out the infestation at once. Unless this is done, and if the fly is allowed to breed unchecked, the later ripening crops of plums, peaches, apples, pears, apricots, and Japanese plums are bound to become more or less badly infested. Combined action should be taken to combat this the most serious pest of the Granite Belt, and growers should realise that, unless they take this action and see that careless growers do not breed the fly wholesale, they will never keep it in check, and it will always be a very heavy tax on their industry. A sharp lookout should be kept for brown rot in fruit, and, on its first appearance in a district, all ripening fruit should be sprayed with lime sulphur 1 in 120.

All grape vines, potatoes, and tomatoes should be sprayed with Bordeaux or Burgundy mixture, as required, for the control of downy mildew and anthracnose of the grapes, and Irish blight and target spot of the potato and tomato.

A "LIGHTNING" FENCE.

Here is a useful idea when a temporary fence is required, for example, to run a piece of netting round some green crop so that it can be fed down by sheep. Staples can be driven into stakes or posts, the wire or netting is pressed against the

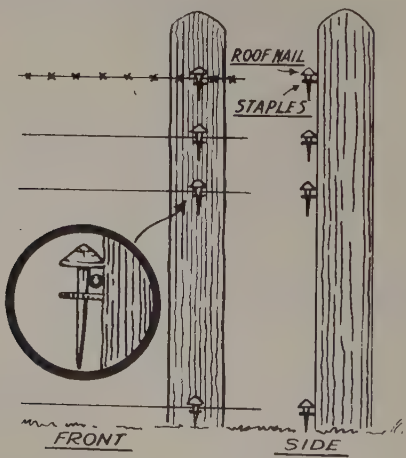
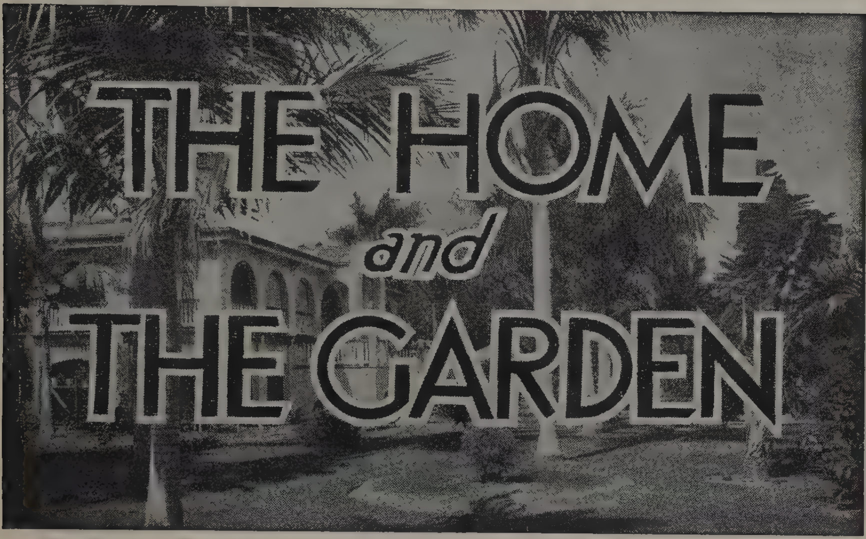


Plate 225.

post, and a roofing nail is dropped through the staples, as illustrated. In winter, when the stakes could be driven in with a mall and pulled out without difficulty, this would be an excellent form of "lightning" fence, which would be useful in many ways.



Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

BABY CLINICS AND THEIR IMPORTANCE IN PREVENTIVE MEDICINE.

IN 1917 four infant welfare centres known as baby clinics were established in Brisbane by the Queensland Government. From this small beginning child welfare work in the State has gradually grown until to-day there are 126 centres and branches spread over Queensland. These extend along the coast from Mossman in the north to Coolangatta in the south, into the interior from Mount Isa in the north-west to Cunnamulla and Quilpie in the south-west and along the railway lines connecting the interior with the coast. Child Welfare Service is still a growing one.

The gap in the supervision of the physical development of the child between infancy and school age is being gradually filled. For years our nurses have been making a study of the values of all common foods, including their vitamin and mineral content. This knowledge they have been disseminating in a practical manner amongst the mothers with whom they have come into contact during their work in various parts of the State. As a result of their efforts a better understanding of nutrition has come about.

Originally the activities of the Infant Welfare Service were concentrated on saving the lives of infants. It soon became evident, however, that the health of the infant was intimately bound up with the health and well-being of the mother. The efforts to save the lives of children and the attempts to render motherhood safe became merged into a

common endeavour. Hence it was that in 1929 two ante-natal clinics in connection with our baby clinics, and recently a number of branch clinics in the metropolitan area and suburbs, were opened.

For some time past it has been realised that the title "baby clinics" did not adequately designate the nature of the work undertaken. For this reason the Department of Health and Home Affairs has approved of the title Maternal and Child Welfare Centre instead of Baby Clinic being applied.

Sickness Prevention.

In spite of the fact that welfare centres have been in existence in Queensland so long there is still present in the minds of many people a misunderstanding regarding the objects for which they were established. There are still those who think that these centres exist for advice and treatment of those who are sick. This is not so. These centres have been established with the object of preventing sickness. It is inevitable that sickness will occur, but much can be prevented by a knowledge of the first signs and symptoms of disordered bodily function and of the methods by which disease is spread. It is in regard to the prevention of sickness that our nurses, who hold general, obstetric and child welfare certificates, are qualified to advise mothers.

The Expectant Mother.

One of the most important aims of the Maternal and Child Welfare Service is to help expectant mothers. It is not intended that the nurse should take the place of the doctor, to whose work the nurse's should be complementary. As the result of her special training in the principles of nutrition the welfare nurse is well qualified to advise the expectant mother in regard to the selection of food and its preparation. She is qualified to detect the early signs of departure from a state of health and refer the mother to the medical attendant.

The New-born Infant.

Another important object of the Maternal and Child Welfare Service is to visit as early as possible all mothers of new-born infants in the district in which each centre is situated. To enable this to be done a copy of the birth notice is received within a few days of the birth and this makes it possible for the nurse to see the mother at a time when advice is most needed. In the first place the welfare nurse advises the mother that she can feed her baby naturally either wholly or partly. She informs the mother that the baby who is fed naturally is healthier and happier than one who is fed unnaturally. The nurse invites the mother to visit the Clinic regularly for supervision. If the mother experiences any difficulty in regard to baby's care or management the nurse is able to advise her.

The Pre-school Child.

The Maternal and Child Welfare Service also supervises the management and the feeding of the toddler. When he reaches school age he comes under the supervision of the School Medical Service. Food plays a very important part in maintaining health. It must be of the right kind as well as sufficient in amount. The diet should include milk, meat, including fish, poultry, liver and kidney, eggs, cheese, butter, lettuce, grated carrot, tomatoes, cooked vegetables including potatoes, peas, beans, cauliflower, marrow, pumpkin, chokos, uncooked fruit,

including apple, papaw, orange, wheatgerm meal or wholemeal bread. If the diet is deficient the teeth, as well as the general health, will suffer. In fact, the condition of the teeth may be regarded as an index of general nutrition.

Information on all matters relating to infant and child welfare may be obtained by visiting the nearest Maternal and Child Welfare Centre (Baby Clinic), or by writing to the Sister in Charge, or by communicating direct with the Maternal and Child Welfare Centre (Baby Clinic), Alfred Street, Fortitude Valley, N.1., Brisbane.

IN THE FARM KITCHEN.

CHEESE FLAVOURING.

Cheese and Rice Croquettes.

Take 1 cupful grated cheese, 2 cupfuls cold boiled rice, 1 egg, 1 cupful milk, ¼ cupful butter, one-third cupful flour, salt, paprika, chopped parsley, breadcrumbs, 1 egg.

Melt the butter in a saucepan, add the flour, and gradually stir in the milk, keep stirring until it thickens, add cheese, and stir till melted. Season to taste. Cool, add rice, and shape into croquettes. Roll in fine dry breadcrumbs, then in slightly-beaten egg, and lastly in breadcrumbs, and fry in smoking hot fat until golden brown. Garnish with chopped parsley.

Cheese and Cabbage.

Take 1 cupful grated cheese, ½ cupful breadcrumbs, 2 cupfuls milk, 3 cupfuls cooked cabbage 4 tablespoonfuls butter, salt, pepper to taste.

Melt the butter, add the flour, and blend together. Stir in the milk till smooth and creamy, and simmer slowly for about ten minutes. Add cheese, cabbage, and seasoning to taste and mix thoroughly. Pour into a greased pie-dish, cover with bread-crumbs, place small dabs of butter on top, and bake in a moderate oven for about half an hour.

Cheese Sausages.

Take 1 oz. Parmesan cheese, 2 oz. cheddar cheese, 1 whole egg, 1 egg-yolk, 1 oz. butter, ½ pint milk, 2 oz. flour, salt, cayenne, egg and breadcrumbs, deep fat for frying.

Melt the butter in a saucepan add the flour, then stir in the flour, and continue stirring until the mixture becomes thick and smooth and leaves the sides of the pan, then draw aside and cool the mixture a little. Add the egg-yolk, and, when well mixed in, add the whole egg and beat it well for a few minutes. Stir in the finely-grated cheese, add seasoning to taste, then turn mixture on to a plate and leave it till firm. Divide the firm mixture into twelve portions. Form them into sausage shapes, brush them with egg, and coat them with breadcrumbs, then put them in a frying basket and fry them in hot fat until golden brown. Drain the cheese sausages, and serve them garnished with parsley.

Cheese and Celery au Gratin.

Take 1 cupful cooked spaghetti, 1 cupful white sauce, 1 cupful grated cheese, ½ cupful breadcrumbs, 2 cupfuls diced celery, butter.

Mix celery and spaghetti, cut into small lengths, together. Stir in white sauce and grated cheese, mixing well throughout. Turn into a fireproof dish. Cover with breadcrumbs. Dab all over with tiny bits of butter. Bake in the oven till golden brown on top.

Golden Cheese Marbles.

Take 1½ cupfuls cheddar cheese, 2 egg-whites, 2 tablespoonfuls flour, paprika, ½ teaspoonful celery salt.

Beat the egg-whites till light, but not stiff, add the flour, cheese, paprika, and celery salt, then roll the mixture into balls the size of marbles, and fry till golden brown in deep fat. Serve on a hot dish lined with a lace paper doily.

Cheese Eggs.

Take 4 eggs, 1½ oz. butter, 1 teaspoonful chopped parsley, 4 dessertspoonfuls grated cheese, salt and pepper, hot buttered toast.

Make four pieces of hot buttered toast, and keep them warm. Beat up the eggs. Grate the cheese finely and add it to them. Wash, scald, and chop the parsley finely and add this also. Mix together and season with pepper and salt. Melt the butter in a small saucepan, add the eggs, &c. Stir over a very low gas until the cheese melts and the eggs thicken and set. Heap on the toast and serve at once.

Cheese and Onion Toast.

Take 3 oz. grated cheese, 1 oz. butter, 1 onion, 1 egg, ½ teaspoonful flour, pepper and salt, 2 slices toast, parsley.

Peel and boil the onion in a covered saucepan until tender. Drain well, then mince. Melt butter in a saucepan, and stir in flour and onion. Stir till frothy. Season to taste. Stir for a moment over heat, then cool slightly and stir in egg and cheese. Stir till cheese is melted. Serve on hot buttered toast, cut in half, and garnish with parsley.

Cheese Flakes.

Take 2 oz. cheese, salt, and cayenne, ¾ lb. flaky pastry, 1 egg-white.

Grate the cheese finely. Take a good flaky pastry and roll it out very thinly, then turn it on to the other side. Beat the egg-white until slightly frothy. Cut the pastry into small squares. Take one-third of the squares and brush them over with some of the egg-white. Sprinkle grated cheese over, then season with salt and cayenne. Place another square on top of each, press it down lightly, brush over with egg-white, and sprinkle with cheese as before, then cover with another square and again press lightly. Brush the tops with egg-white. Place on a baking sheet. Bake in a hot oven from ten to fifteen minutes.

Cheese Fritters.

Take 1½ cupfuls milk, ¼ lb. cheese, 1 teaspoonful paprika, 1 beaten egg, 9 tablespoonfuls flour, 1 small grated onion, 1½ teaspoonfuls salt, breadcrumbs.

Place the milk and flour in a saucepan. Stir till the flour is dissolved. Bring to the boil. Cook for two minutes. Add the finely-cut cheese, onion, paprika, and salt. Turn on to a greased plate and set to cool. It should take about three hours to become firm enough to mould into cutlets. Mould into shape. Roll in flour. Dip in beaten egg, then crumbs. Fry in hot fat until brown. Garnish with watercress.

NO "BUTS" ABOUT BUTTER.

Queensland's sunny climate and the green grass which grows all round (at most seasons) give to our butter a richness in Vitamin A which is denied to most colder countries.

Vegetable fats do not contain this vitamin, which is essential for full health and development. The minimum quantity of butter recommended is 4 oz. per head per week for each member of the family over seven years of age. This quantity can, with advantage, be doubled.

There is no doubt about the nutritional superiority of butter over jam or margarine. Butter has qualities that merit its favour for other reasons than as a fuel for the body.

Butter flavour is at its best when combined with fresh nutty wholemeal or wheatgerm bread. As an addition to cooked vegetables, the texture is improved by butter and the flavour enhanced. The same sunshine that makes Queensland butter so nutritious makes it necessary to store it in refrigerator or ice chest. Modern methods of distribution keep butter firm, but once delivered to the home, the responsibility is that of the housewife. Firm butter is a firm favourite.

With the tendency to reduction in the consumption of white bread and cakes, new uses for butter are needed if an adequate intake is to be maintained. One of the advantages of butter is that there is no waste; it is completely digestible. The modern system of butter inspection and grading gives a uniform product which never varies in texture, appearance, and wholesomeness.—*Queensland Nutrition Council.*

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF AUGUST IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1939 AND 1938, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Aug.	No. of years' records.	Aug., 1939.	Aug., 1938.
North Coast.	In.		In.	In.
Atherton	0·89	38	0·19	0·98
Cairns	1·71	57	0·52	1·50
Cardwell	1·25	67	0·90	1·19
Cooktown	1·18	63	0·23	0·53
Herberton	0·63	53	0·16	0·63
Ingham	1·44	47	1·27	1·59
Innisfail	4·99	58	0·73	9·64
Mossman Mill	1·28	26	0·68	1·09
Townsville	0·49	68	0·54	..
Central Coast.				
Ayr	0·53	52	1·35	..
Bowen	0·62	68	0·63	..
Charters Towers	0·50	57	0·53	..
Mackay P.O.	1·00	68	1·03	0·27
Mackay Sugar Experiment Station	0·84	42	..	0·24
Proserpine	1·38	36	0·31	1·88
St. Lawrence	0·78	68	1·02	0·10
South Coast.				
Biggenden	1·09	40	1·55	1·89
Bundaberg	1·27	56	3·56	1·33
Brisbane	1·95	87	2·29	1·21
Caboolture	1·50	52	2·21	0·83
Childers	1·21	44	3·43	2·01
Crohamhurst	2·16	46	2·52	0·92
Esk	1·44	52	1·29	1·48

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Aug.	No. of years' records.	Aug., 1939.	Aug., 1938.
South Coast—contd.	In.		In.	In.
Gatton College	1·09	40	..	1·25
Gayndah	1·15	68	1·68	1·97
Gympie	1·70	69	1·85	1·55
Kilkivan	1·40	60	1·80	1·61
Maryborough	1·66	68	1·39	1·82
Nambour	1·86	43	3·36	0·74
Nanango	1·31	57	1·67	0·99
Rockhampton	0·81	68	1·18	1·42
Woodford	1·63	52	2·25	0·63
Central Highlands.				
Clermont	0·68	68	1·17	1·41
Gindie	0·63	40	..	0·85
Springsure	1·01	70	1·07	0·85
Darling Downs.				
Dalby	1·19	69	1·08	1·20
Emu Vale	1·09	43	1·77	1·52
Hermitage	1·15	33	..	0·94
Jimbour	1·14	51	0·74	1·18
Miles	1·13	54	1·05	2·92
Stanthorpe	1·78	66	2·18	2·27
Toowoomba	1·62	67	1·73	1·62
Warwick	1·45	74	1·44	1·72
Maranoa.				
Bungeworgorai	0·70	25	..	0·65
Roma	0·89	65	1·08	0·68

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—AUGUST, 1939.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·93	78	58	87	23	51	5, 11, 12, 29	23	2
Herberton	..	75	40	84	28, 29	28	4, 5	16	1
Rockhampton	29·96	76	49	90	28	41	4, 13	118	5
Brisbane	29·90	71	50	88	29	42	13	229	4
Darling Downs.									
Dalby	29·95	67	39	86	28	29	13, 15	108	3
Stanthorpe	..	57	34	77	28	22	13, 18	218	10
Toowoomba	..	63	40	83	28, 29	29	13	173	7
Mid-Interior.									
Georgetown	29·97	82	45	88	27, 28, 29	33	5 5	..	..
Longreach	29·99	74	44	92	28	35		80	2
Mitchell	29·95	67	39	87	28	29	12	141	3
Western.									
Burketown	29·99	83	52	92	21	43	4	..	..
Boulia	30·05	74	45	91	27	38	4, 5, 7, 9	3	1
Thargomindah	29·92	69	44	89	26, 28	33	5	50	2

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	October, 1939.		November, 1939.		MOONRISE. Oct. 1939.	MOONRISE. Nov., 1939.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	5·33	5·51	5·3	6·9	8·12	9·49
2	5·31	5·51	5·2	6·10	9·7	10·45
3	5·30	5·52	5·1	6·11	10·3	11·34
4	5·29	5·53	5·0	6·12	11·0	..
						a.m.
5	5·28	5·53	5·0	6·12	11·52	12·17
6	5·27	5·54	4·59	6·13	..	1·0
					a.m.	
7	5·26	5·54	4·58	6 14	12·24	1·45
8	5·25	5·55	4·58	6·14	1·33	2·26
9	5·24	5·56	4·57	6·15	2·21	3·9
10	5·23	5·56	4·56	6·16	3·6	3·52
11	5·22	5·57	4·56	6·17	3·51	4·39
12	5·21	5·57	4·55	6·18	4·35	5·28
13	5·20	5·58	4·54	6·18	5·19	6·18
14	5·19	5·58	4·54	6·19	6·4	7·10
15	5·18	5·59	4·53	6·20	6·50	8·4
16	5·17	5·59	4·53	6·21	7·41	8·58
17	5·16	6·0	4·53	6·22	8·31	9·52
18	5·15	6·1	4·52	6·23	9·23	10·34
19	5·14	6·1	4·52	6·23	10·17	11·36
						p.m.
20	5·12	6·2	4·52	6·24	11·9	12·26
					p.m.	
21	5·11	6·3	4·51	6·25	12·3	1·18
22	5·10	6·3	4·51	6·25	12·51	2·7
23	5·9	6·4	4·51	6·26	1·44	3·0
24	5·8	6·5	4·50	6·27	2·36	3·54
25	5·8	6·5	4·50	6·28	3·25	4·49
26	5·7	6·6	4·50	6·28	4·17	5·47
27	5·6	6·7	4·50	6·29	5·11	6·45
28	5·6	6·7	4·49	6·30	6·6	7·44
29	5·5	6·8	4·49	6·30	7·2	8·38
30	5·4	6·8	4·49	6·31	7·57	9·30
31	5·3	6·9			8·53	

Phases of the Moon, Occultations, &c.

6th	Oct.	☾	Last Quarter	3 27 p.m.
13th	„	●	New Moon	6 30 a.m.
20th	„	☽	First Quarter	1 24 p.m.
28th	„	○	Full Moon	4 42 p.m.

Perigee, 11th October, at 11 a.m.
Apogee, 23rd October, at 9 a.m.

On 22nd October Saturn will be in opposition to the Sun, rising as the Sun sets.

About 9 p.m. this most interesting planet would be in a favourable position for telescopic observation of its ring-system, which since 1936 has widened out until it is nearly half-way towards its greatest phase, when it will be opened to its fullest extent (1943). Since its discovery by Galileo with his "optic glass" (which showed him a small detached globe on either side of the planet). Great astronomers with powerful instruments have found the true nature of this beautiful and altogether unique ring-formation. Only fifty years after Galileo's discovery, Huyghens in 1655, announced in a latin cryptograph that Saturn "was surrounded by a ring, thin and flat, nowhere adhering and inclined to the ecliptic." Later it was seen that the system consisted of three rings, and lastly that these could not be rigid but must be composed of tiny particles revolving around the planet.

Of a partial eclipse of the Moon on the 28th, visible in Europe and North and South America, very little will be seen on the east coast of Australia, the Moon rising (at Warwick) when leaving the darkest shadow.

Mercury rises at 5.54 a.m., 21 min. after the Sun and sets at 6.20 p.m., 29 min. after it, on the 1st; on the 15th it rises at 6.1 a.m., 43 min. after the Sun, and sets at 7.8 p.m., 1 hr. 9 min. after it.

Venus rises at 5.57 a.m., 24 min. after the Sun, and sets at 6.21 p.m., 30 min. after it, on the 1st; on the 15th it rises at 5.52 a.m., 34 min. after the Sun, and sets at 5.44 p.m., 56 min. after it.

Mars rises at 12.46 p.m. and sets at 2.36 a.m. on the 1st; on the 15th it rises at 12.24 p.m., and sets at 1.5 a.m.

Jupiter rises at 5.28 p.m. and sets at 5.36 a.m. on the 1st; on the 15th it rises at 4.24 p.m. and sets at 4.35 a.m.

Saturn rises at 7.26 p.m. and sets at 6.54 a.m. on the 1st; on the 15th it rises at 6.26 p.m. and sets at 6.7 a.m.

4th	Nov.	☾	Last Quarter	11 12 p.m.
11th	„	●	New Moon	5 54 p.m.
19th	„	☽	First Quarter	9 21 a.m.
27th	„	○	Full Moon	7 54 a.m.

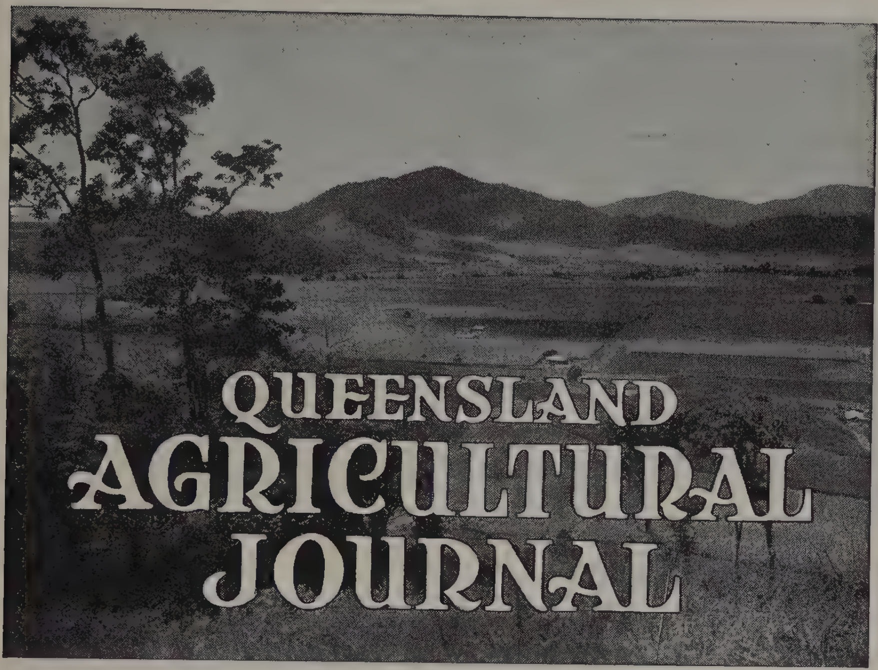
Perigee, 8th November, at 7.0 a.m.
Apogee, 20th November, at 5.0 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling**, members of Agricultural Societies, **Five Shillings**, including postage. General Public, **Ten Shillings**, including postage.



Vol. LII. 1 NOVEMBER, 1939 Part 5

Event and Comment

Fodder Conservation on the Atherton Tableland.

THE problems of individuals are often the problems of the community and as such become matters on which the assistance of the Government is frequently sought for a solution. This is particularly so in the case of the man on the land. On the one hand, nature is bounteous and, conversely, sets up conditions which require more than ordinary treatment to enable farmers to reap the benefit of their industry.

In amplifying these remarks the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, stated that he had in mind the difficulties experienced and the loss of income suffered by settlers through the incidence of the white grub pest introduced in pastures on sections of the cleared rain-forest country on the Atherton Tableland.

Although many years of research have been devoted by departmental officers to determining the most suitable method of combatting white grubs, no effective way has yet been evolved for their extermination, but the work is still going on, and the day may not be far distant when the same success will be achieved as was the case with prickly-pear infestation. One definite result of material benefit has emerged, and

that is the conservation of fodder in pit silos which can be constructed at a very reasonable cost. In this way reserve supplies of rich milk-producing food for dairy stock can be built up as an insurance against those periods when the white grub outbreaks are severe.

To complete the work which had already been accomplished, a scheme for advances to meet the cost of putting down pit silos was inaugurated in September, 1938, whereby suitable loans were made to those farmers who were unable to provide funds from their own resources. Several settlers took advantage of the scheme and the results obtained to date have proved satisfactory, added Mr. Bulcock.

A survey of the position has now been made, and it has been decided to provide special funds this year for an extension of the project, of which the financing will be administered by the Rural Development Board. The value of the scheme in the matter of farm economics has been amply demonstrated, and farmers desirous of obtaining the necessary accommodation should get in touch with the Land Agent or the Inspector of the Bureau of Rural Development at Atherton to obtain the necessary application form. Officials of the Department of Agriculture and Stock and of the Land Administration Board will give every possible assistance to those who wish to avail themselves of the funds being provided. Each application will, of course, be dealt with on its individual merits.

As was the case in connection with last year's scheme, advances will not be restricted to present borrowers from the Bureau of Rural Development. Farmers whose properties are in the area where pastures are affected by the depredations of the white grub and who are carrying on dairying on a commercial basis will be eligible to apply.

Generally, the security required for an advance for a pit silo will be an order on the butter factory providing for small monthly payments of an amount sufficient to repay the advance and to meet the interest thereon within the time specified. A maximum repayment term of five years will be allowed, and the rate of interest on each advance will be 4½ per cent. per annum.

The Peanut Industry.

OF the newer agricultural enterprises in Queensland, peanut-growing is, probably, advancing most rapidly; and in order to make better provision for disease control and otherwise to protect the industry, legislation has now been passed by Parliament. In the course of his speech on the initiation of the Bill in committee, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, said that the commodity board at present controlling the sale of the product had been remarkably successful, and that the board was in every way fitted to discharge its duties not only to suppliers, but also to the consumers. The risk of disease in the plant and the necessity for limiting its incidence were the chief reasons for introducing protective legislation.

His own view, the Minister said, was that the time to deal with a disease was when it first manifested itself. There was a disease that had affected the peanut industry in various parts of the world, known as rosette. If it ever established itself in the peanut-growing districts of Queensland it would be a very serious thing for the growers, because wherever it had become established in other parts of the world, the industry had become extinct.

This Bill dealt first with the question of control, continued the Minister. It followed generally the lines approved on very many occasions for the control of plant and animal diseases. They had had, of course, a good deal of experience in disease control in agricultural industries. There was the Diseases in Plants Act, but frequently certain deficiencies in that Act in relation to many of the diseases in sugar-cane were discovered and it became necessary to give an industry its own charter in respect of disease control, at the same time preserving those things applicable to it in the Diseases in Plants Act. The measures of control in the new legislation did not introduce any principle with which the Legislative Assembly was not acquainted.

Passing from the question of control, Mr. Bulcock dealt with the stability of the industry. The real basis of agricultural prosperity was the stability of rural industry, he said. Consequently, he was making an attempt, at the request of the growers, to give them the stability that was essential to the sound development of the peanut industry. It had to be remembered that the pool board which handled this crop had a greater capital investment probably than any other pool-controlled industry in Queensland. Since it had successfully managed the industry and since Parliament had almost every session reaffirmed the principle that the pooling system was a proper form of organisation, and since both sides of the House had always agreed to the application of this principle of organised marketing, it followed obviously that any action that could be taken to stabilise the industry and preserve that system should be taken.

Discussing the market demand, the Minister remarked that the capacity of the Australian market to absorb edible nuts could be calculated with great exactitude. Necessarily, the definition ''edible nuts'' excluded nuts used for oil-expression. He was not altogether satisfied that using peanuts for that purpose was a very economic method of sustaining the industry. The cost of recovery was such that the return so diluted the return from the sale of edible nuts that the grower did not get, at any rate, more than a reasonable price for what he had produced. Of course, even that always depended on a favourable and economic balance between the volume of edible nuts and oil nuts.

There was, he continued, a growing tendency in the industry to produce beyond the limits of what could be termed edible consumption. He sought to overcome that difficulty by establishing two pools; one to be the pool that would deal with the estimated volume of edible nuts required in any one year in Australia, and the other to be the pool that would treat the residue for oil-expression. The result would be that although it was not sought to impose any restriction on the production of nuts, everybody who was engaged in the industry would get a fair share of the Australian edible nut trade. The Peanut Board would be required to issue quotas on a tonnage basis equal to each grower's required contribution and the total of these contributions, of course, would be the estimated annual consumption of peanuts within the State.

If in any year the board should not be able to dispose of the estimated quantity in No. 1 pool, it would be transferred to No. 2 pool. If, on the contrary, the board had estimated its intake for No. 1 pool at a lower level than the actual consumption, it would transfer enough from No. 2 pool to No. 1 pool to make up the deficiency. This would mean that so far as the first pool was concerned there would be stabilisation of a very definite character.

White Grubs and Pasture Deterioration on the Atherton Tableland.*

D. O. ATHERTON, M.Sc., Research Officer.

I. Introduction.

II. Control of White Grubs.

III. Pasture Management—
- (1) Rotational Grazing.
- (2) Renovation.
- (3) Renovation and Manuring.
- (4) Renovation and Replanting.
- (5) Replanting after Cultivation.

IV. Lucerne—
- (1) Lucerne in Pastures.
- (2) Grazing Lucerne
- (3) Lucerne Silage.

V. Fodder Crops—
- (1) Silage Crops.
- (2) Maize for Grain.
- (3) Fodder Crops and Fertilizers.

VI. Summary and Conclusions.

VII. Acknowledgments.

Bibliography.

Appendices I.-X.

INTRODUCTION.

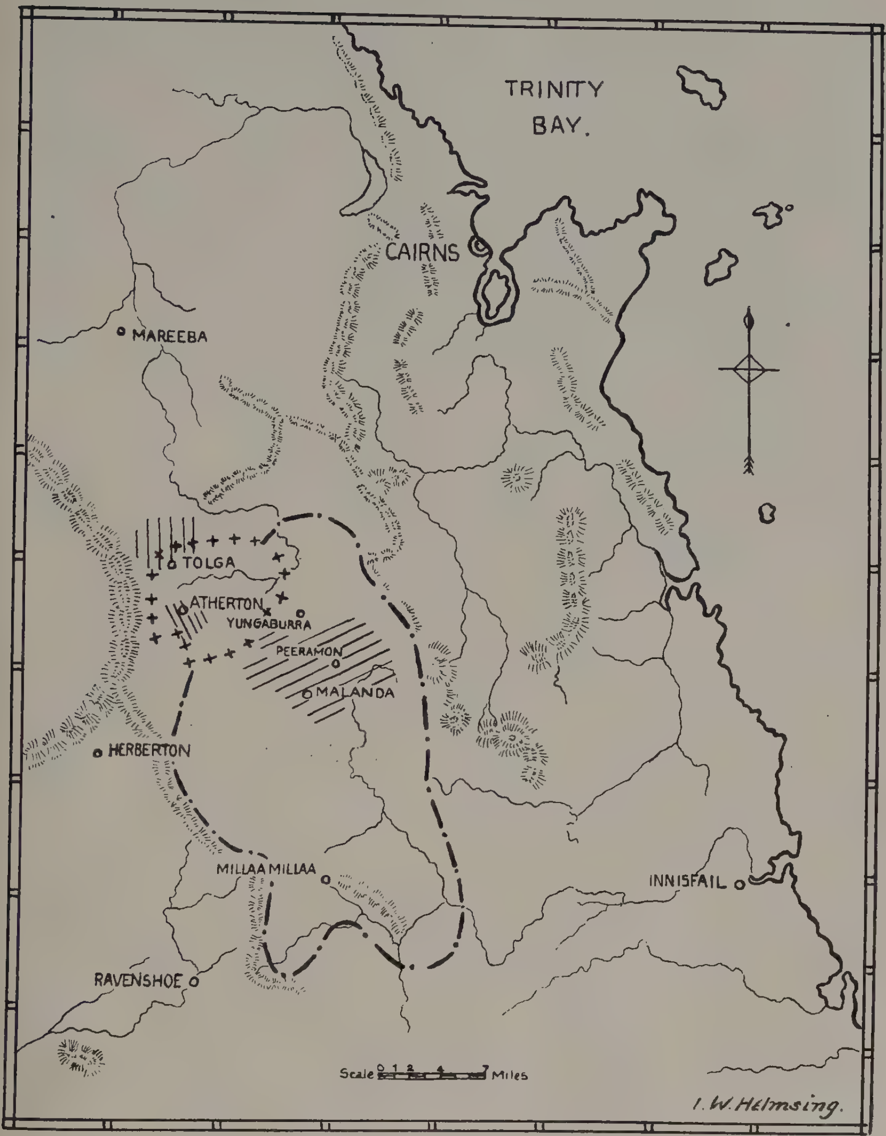
THE carrying capacity of pastures on the Atherton Tableland has been seriously reduced in recent years. One beast to the acre was reputedly a common rate of stocking during the early years of settlement, but recently pastures have carried not more than a beast to 3 or 4 acres.

White grubs—larvæ of a Scarabæid beetle (*Lepidiota caudata* Blkb.)—are closely associated with marked pasture deterioration in the area east of the Barron River and between Malanda and Yungaburra. This area is outlined in Plate 226, and is referred to as the Peeramon district to simplify discussion.

The infested area was computed at 10,000 acres in 1930, but by the winter of 1935 it had increased to 25,000 acres. However, it is unlikely that white grubs are solely responsible for the deterioration of Tableland pastures. Soil fertility declines within a few years after the rain-forest is cleared in tropical countries, experiencing high temperatures coupled with heavy rains (Jack, 1934; Corbet, 1935). Thus it is probable that Tableland soils have reacted in a similar manner, and then the problem at Peeramon becomes a composite one, in which the influence of white grubs is but one factor.

The results of entomological investigations have already been published (Smith, 1936), but a brief note on the life history and habits of the pest may clarify the subsequent discussion. The pest requires two

* Following the serious losses associated with white grubs in paspalum pastures on certain parts of the Atherton Tableland, the Secretary for Agriculture and Stock (Hon. Frank W. Bulcock) formed a White Grub Investigations Committee to elaborate methods of reducing such losses in the future. The committee, comprising the Director of Tropical Agriculture (chairman), the author (secretary), and three farmers, was formed in September, 1935, and the present report describes the results of the investigations extending over the ensuing three and a-half years. The White Grub Investigations Committee has now been replaced by the Tableland Experiments Committee, which handles a wide range of problems, including the continuation wherever necessary, of the various projects discussed in this report.



MAP SHOWING THE ATHERTON TABLELAND.

—·—·— Encloses mainly dairying districts.

+ + + + + Encloses mainly maizegrowing districts.

////// Area infested by *Lepidiota caudata* Blb.

|||||||||||| Area infested by *Lepidoderma albohirtum* Waterh.

\\\\\\\\\\ Area infested by *Lepidiota lævis* Arrow.

Plate 226.

years for the completion of its life cycle. Eggs are laid in the soil, within 4 inches of the surface, in November, December, and January. They hatch in about three weeks, and the larvæ pass through three instars during a growing period of approximately eighteen months. Full-grown larvæ descend in the soil between July and September and pupate in earthen cells at variable depths up to 2 feet, where the pupæ transform into the rather large, brown, adult beetles. Emergence occurs at dusk in the early summer, frequently on the evening following a heavy storm, and the beetles fly about in enormous numbers before mating on some prominent object, such as a large log, fence, or house. The beetles re-enter the soil before morning and remain hidden 1 or 2 inches below the surface until the following evening. Oviposition extends over a period of several weeks after emergence, and the evening flights occur regularly throughout this period. Beetle emergence cannot begin until summer rains have softened the soil down as far as the pupal chambers in which the adults are imprisoned. Consequently, when the rainfall prior to early December is insufficient to penetrate 1 or 2 feet of soil, the pre-emergence mortality is considerable, and may be high enough to constitute a temporary control of the pest.

The entomological investigations indicated that, in order to reach an economic solution to the problem, some attention to its agronomic aspects was desirable.

TABLE I.

RAINFALL AT MALANDA IN POINTS.

(JULY-NOVEMBER.)

Year.	July.	August.	September.	October.	November.
1916	417	144	458	46	158
1917	**28**	**221**	**36**	258	632
1918	289	350	**81**	**5**	**155**
1919	319	**50**	**284**	**7**	**90**
1920	**135**	**57**	**67**	**233**	**124**
1921	294	296	186	504	76
1922	**152**	**0**	**72**	**113**	**63**
1923	**81**	**170**	**18**	**20**	**212**
1924	1,107	332	218	155	645
1925	**41**	**224**	**61**	**13**	**127**
1926	59	121	309	2	213
1927	**273**	**0**	**99**	**162**	**18**
1928	**254**	**104**	**0**	**2**	539
1929	**27**	**104**	**105**	**39**	**255**
1930	357	87	80	476	135
1931	**115**	**93**	**71**	**143**	598
1932	170	317	**48**	**65**	**34**
1933	159	394	162	350	672
1934	251	43	387	125	750
1935	102	336	5	279	257
1936	480	**20**	**279**	**100**	106
1937	443	**217**	**159**	**67**	562

N.B.—Periods of three successive months in which the total rainfall is less than 4½ inches are shown in heavy type.

Almost the whole area now infested by white grubs was originally heavy rain-forest on morocco red or lighter-coloured soil derived from scoriaceous or sheet flows of basalt surrounding outliers of granitic rock. The annual rainfall varies from 67 inches (Malanda—22 years' average) to 81 inches (Gadgarra—16 years' average). In fourteen

of the twenty-two years for which Malanda rainfall records are available there was insufficient rain during three or more consecutive months between July and November to maintain productive pastures (Table I.). The arbitrary standards chosen to indicate periods too dry for the satisfactory growth of pastures—a total of less than $4\frac{1}{2}$ inches for three consecutive months, with not more than 3 inches in any one month—may seem excessively high, but they are justified by local experience. Thus, some three to five months of inadequate precipitation can be expected in about two years out of three. This in itself, quite apart from any question of white grubs, is an important factor in limiting dairy production under the existing system of grassland farming. There is a good growth of grass in the summer months following early thunderstorms, and in most years, provided white grub damage is not severe, the pastures are productive until about the beginning of winter. From July onwards in normal years the feed available from paspalum pastures declines in quality and quantity during the dry spring and early summer months until the summer storms occur near the end of the calendar year.

Much of the rain-forest was cleared and the land seeded with Rhodes grass (*Chloris gayana*), paspalum (*Paspalum dilatatum*), and clover (*Trifolium* spp.) from twenty to thirty years ago. The paspalum became dominant on most farms within a few years, and on many of the properties the pasture has been more or less continually grazed ever since. Most of the land is still littered with partly-decayed rain-forest remains, such as tree trunks, stumps, and even dead Penda trees (*Xanthostemon pubescens*), the latter being left uncut when clearing, on account of their hardness. Very few farms have been extensively subdivided, and thus, in most cases, the adoption of rotational grazing as a normal part of farm management is at present impracticable. Various clovers have been re-sown more than once on many properties, but the only type which has persisted is white clover (*Trifolium repens*), and even this is successful only in comparatively wet areas or during a season with good winter and spring rains. With the exception of a few small areas recently treated, few of the pastures have received artificial fertilizers.

Attempts to establish and maintain lucerne (*Medicago sativa*) in the area were unsuccessful, even where the seed was sown in well-prepared ground. Maize rarely grew satisfactorily after the land had been in cultivation for a few years, and farmers were forced to rely on cow-cane, which, though unsatisfactory, was the only available reserve fodder for the dry season. Winter green feeds such as the cereals and field peas have been grown in some years, but usually the onset of the dry season before they mature makes them speculative crops, which are seldom of any value after August.

The problem as outlined was obviously a composite one, the entomological and agricultural difficulties overlapping, and with no simple solution apparent. The main lines of investigation suggested by a critical survey of the problem, are enumerated below—

(*a*) The control of white grubs by entomological means such as parasites, predators, diseases, insecticides, light traps, and pig-grazing;

(*b*) Better management of pastures by rotational grazing, mechanical renovation, and the addition of lime and fertilizers;

cf. xxv, 163.

(*c*) The elaboration of suitable pasture mixtures for local conditions, with the inclusion of legumes and grasses other than paspalum, and the determination of methods for establishing such pastures;

(*d*) The elaboration of effective methods for establishing, maintaining, and utilising lucerne;

(*e*) Exploitation of the normally excellent summer weather conditions to grow fodder crops which can be stored for use during the dry season; this involves the selection of crop mixtures suitable for making protein-rich silage;

(*f*) Experimenting with fertilizers which may be used profitably on summer fodder crops.

CONTROL OF WHITE GRUBS.

Various white grubs occur as pests in many parts of the world, and numerous attempts to evolve control measures have been made (Jarvis, 1926; Luginbill, 1938; Neiswander, 1938). The greatest factor governing the method of control adopted is an economic one. For example, several species are pests in golf greens and parks, where they can be controlled by the incorporation of lead arsenate in the top layers of soil (Fleming, 1936; Neiswander, 1938). Others occur as pests of sugarcane in Queensland, and methods of dealing with these by the use of soil fumigants have been in use for some years (Jarvis, 1926). Unfortunately, however, the problem of controlling white grubs in pastures is very different from that of their control in either of the examples quoted above. The cost of applying such control methods is in excess of the total annual return which can be expected from pastures used for dairying in North Queensland, and therefore, the use of insecticides is economically unsound.

Scoliid wasps are parasitic on the white grubs, and a Tachinid fly (*Palpostoma testacea* R.D.) is parasitic on the beetles. The percentage of parasitism is always extremely low, however, even under the most favourable circumstances, and it is unlikely that these or any other insects could be exploited as parasites for the control of indigenous white grubs. XXVII, 603. XXVI, 267

A bacterial disease of the larvæ has been reported (Atherton, 1931; Smith, 1936), but, in spite of a mortality as high as 70 per cent. in the larvæ of heavily infested patches in the 1937 winter, a large flight of beetles occurred at the end of that year. Apparently larvæ outside the very heavily infested patches were not affected to any appreciable extent, and there is little prospect of using the disease organism for control purposes.

The Giant American Toad (*Bufo marinus*) was recently introduced by the Bureau of Sugar Experiment Stations into North Queensland, and the possible utility of such a predator on the adult beetles prompted the liberation of some fifteen to twenty thousand young toads on the Tableland. It appears that the toad may not be successfully colonised at altitudes greater than about 1,200 feet (Pemberton, 1935), and the mean altitude of the Atherton Tableland is about twice this figure. However, a number of the toads have reached maturity on the Tableland, and further developments can be watched with some interest.

During favourable storm seasons, enormous numbers of beetles are on the wing in the affected area in November, December, and January. The possibility of controlling the pest at this stage has been considered. The use of light traps was attempted (Smith, 1936), but only a very small percentage of the beetle population was attracted to the strong acetylene lamps used, and it is therefore improbable that light traps will be of any value for control purposes.

Reducing the beetle population by allowing pigs free range over pastures has been practised by some farmers during the flight season (Smith, 1936). The pigs become very partial to the beetles and consume enormous numbers when they have access to places in which the latter congregate.

A trial of this method of protecting pastures from white grub attack was initiated at the end of 1935. During the flight season, pigs were given free range over enclosed pastures at rates of four, three, two, and nil head per acre in one-acre fields. The animals made satisfactory gains in weight, though given maize grain only as a supplement to the beetles and pasture. They were later sent to the bacon factory, where there were no adverse comments on carcase quality after slaughter. The fences were removed from around the plots after the trial, and during the following year stock showed a preference for the pasture of the experimental area. White grub population counts from the various parts of the experimental area were planned for the winter of 1937, when damage by white grubs should have been evident; but, at the end of 1936, pigs were inadvertently given access to all pasture on the farm, including the old experimental area, during the flight season. Considerable rooting for grubs occurred in the old plots, and there was much more disturbance of the pasture in the plot which had carried no pigs than in any of the others. Examination of the area in 1937 showed that very few grubs were present, and no differences between the various plots of the old experimental area could be detected. The obvious preference for the control plot shown by the pigs at the end of 1936 indicates that white grubs were more prevalent in the part of the experimental area which had carried no pigs during the previous beetle flight. Thus it is reasonable to assume that allowing pigs free range over pasture during beetle flight affords some measure of protection to that pasture.

The period during which a grass shortage will occur on white grub infested farms can be predicted some eighteen months in advance (Smith, 1936), and methods of using this information are outlined in a later section of this report.

PASTURE MANAGEMENT.

The present methods of pasture management are frequently inadequate, quite apart from any question of white grub infestation. In the first place, there is no justification for allowing tree trunks and stumps to remain in the fields twenty to thirty years after clearing. These obstructions serve as centres for beetle concentration, and thus for grub infestation. The retention of 40 to 50-acre fields does not permit the best use of the available pastures, as it is impracticable to use such large fields for effective rotational grazing. It is often suggested that paspalum pastures become rootbound and unproductive when continuously grazed over a period of years. Pastures comprising one species

only—and that a grass—can never be as profitable as the ideal grass-legume sward type. Further, continuous grazing as practised on the Atherton Tableland must lead to impoverishment unless methods for re-establishing soil fertility, at levels capable of maintaining the productivity of pastures, can be devised.

Rotational Grazing.

Chemical analyses and feeding tests have shown that grasses and pasture plants possess their maximum feeding value in the young stages, generally after having made three or four weeks' growth (Grunder, 1933; Richardson, Trumble, and Shapter, 1932). Thus the best way to use a pasture is to keep it free of stock for about three weeks, and then feed off the growth as quickly as possible (Hodgson, 1933). Management along these lines is only possible on well-subdivided properties. Some means of cutting and storing surplus pasture when such is available is also necessary, as a pasture which has been allowed to grow rank falls off very considerably in feed value. Small silos of 10 to 20 tons capacity might be used for storing the surplus young grass, provided 3 to 5 per cent. of molasses is added to assist in curing.

A demonstration of rotational grazing on paspalum pasture was conducted in 1936. Three small adjacent 4-acre fields were provided, each giving access to permanent water. In the absence of suitable dairy cattle on the property, young steers were used, and these, grazed at the rate of a beast to 2 acres, made satisfactory gains in weight. It was considered that animals grazing under the rotational scheme made better gains than similar animals grazed continuously in a large paddock of otherwise similar pasture. Since this demonstration was conducted, several dairymen have subdivided their properties and adopted the practice of rotational grazing.

Renovation.

Methods of renovating old and unprofitable paspalum pastures in Southern Queensland have been described (McKeon, 1927; Winders, 1938). Comparable means of reinvigorating paspalum pastures on the Tableland are equally necessary, even when the grass is not known to be affected by white grubs.

Several dairymen on the Atherton Tableland began renovating pastures by the use of implements some ten to twelve years ago. The usual method is to clear the land of tree trunks and stumps and plough the sward during the wet season. Disc ploughs have always been used for the renovation, leaving a very rough surface. Stock are excluded for some months after ploughing, until the grass is well established again and has seeded. If rain falls soon after ploughing, this method of treatment gives very satisfactory results the first time it is done; pasture regrowth is quite vigorous, and the carrying capacity of the land is increased to a marked extent. The beneficial effects are, however, transitory. Within from five to seven years of treatment the renovated pasture has deteriorated again until it is little or no better than when treatment was first carried out. Further renovation is then necessary, and implements may again be used. The results from second and third renovation treatments are, however, much less spectacular and short-lived than those obtained when pastures are ploughed for the first time.

Several methods of renovation with readily available implements were investigated at Peeramon (Appendix I.). The pasture was old grub-infested paspalum, which had not been renovated or treated in any way since grassing was completed approximately twenty years previously. After clearing off old waste timber, the treatments were applied in duplicate at the beginning of November, 1935, and comprised ploughing with both disc and mouldboard implements, followed by harrows twice, once, and not at all, and control or untreated pasture. The early storms which were expected did not eventuate, and some eight weeks of dry, hot weather followed the ploughing. Under these conditions, the two "mouldboard-ploughed only" plots were much superior to any of the others. Examination of the area early in 1936 showed that *L. caudata* beetles had not entirely avoided the ploughed sections during the flight a few months before. Three years after treatment, the pasture on the "mouldboard-ploughed only" plots was still quite satisfactory, but recovery had been quite negligible in all of the other plots, and they were over-run with useless weeds and grasses.

Sufficient data is available to suggest that renovation by ploughing cannot be regarded as anything but a palliative under Tableland conditions. In spite of its limitations, however, renovation could be exploited on more farms to improve old paspalum, pending the elaboration of more satisfactory methods of establishing and maintaining permanent pastures. Plough renovation of a sward containing both paspalum and white clover may temporarily suppress the legume (Appendix II.). This drawback has no great practical significance at the moment, as white clover does not occur in most of the old paspalum pastures in the grub-infested area.

Renovation and Manuring.

Chemical analyses of soils from the grub-infested area show that they may be very acid—pH values range from 4·6 to 5·7—and that the supply of available plant foods is frequently low. The possible effects of lime and various fertilizers in pasture renovation were therefore investigated. Two experiments were conducted and observational data obtained from each.

In the first experiment (Appendix II.) several treatments were applied to a pasture which was not severely grub-infested and carried an appreciable quantity of white clover. The treatments, liming with and without nitrogen as sulphate of ammonia, were applied to unploughed, mouldboard-ploughed, and disc-ploughed pasture. The land was ploughed about a month before the onset of the summer rains in 1935.

Observations in 1936 indicated that the clover had been suppressed in the ploughed plots, though still vigorous in the untreated area. There was no apparent response to lime by the clover or the grass. There was a very marked response to sulphate of ammonia on unploughed pasture. The nitrogen was applied in two equal dressings, and the growth response was evident within a few weeks of application in each case. The regrowth of paspalum was so vigorous on the ploughed plots that any possible effect of added nitrogen was almost completely masked, particularly after the first application in mid-January, 1936. The recovery of the paspalum was much more rapid in the mouldboard-ploughed than in the disc-ploughed area, and the surface of the ground

(*a*)

(*b*)

Plate 227.

WHITE GRUB INFESTED PASTURE RENOVATED BY PLOUGHING—(*a*) With a mould-board plough; (*b*) with a disc plough. Note the even surface favourable for rapid pasture re-establishment in the former.

was certainly more level (Plate 227). White grub injury, was quite obvious in the unploughed area during the first part of 1937, but there was no visible damage in the ploughed sections.

The land used for the second experiment with lime and fertilizers on pasture (Appendix III.) was grub-infested, and carried a poor pasture of paspalum, with which was associated carpet grass (*Axonopus compressus*) and a little kikuyu (*Pennisetum clandestinum*). This area had been twice renovated by ploughing during the ten years immediately prior to the initiation of the experiment. The old pasture was ploughed once, early in January, 1937, and then lightly harrowed to even the surface without destroying the grass. Quicklime was applied at rates of 4, 2, and nil tons per acre, and on each of the strips so treated nitrogenous (22 lb. N per acre) and phosphatic (22, 66, and 76 lb. P_2O_5 per acre) fertilizers were applied in duplicate. After the fertilizers were harrowed in, perennial Korean clover (*Lespedeza sericea*) was sown over the whole experimental area at the rate of 1 lb. per acre. White clover at 3 lb. per acre was sown on the whole area early in April.

Very disappointing results were obtained. Neither of the legumes was satisfactorily established, and none of the lime or fertilizer treatments effected any visible improvement in the pasture. After the addition of such appreciable quantities of lime, nitrogen, and phosphate, considerable differences between treated and control plots were expected, but none was observed. However, the experiment indicated that a single application of lime, phosphate, and nitrogen was of no value in the third renovation of this particular paspalum pasture. There is no evidence to indicate whether repeated annual applications of fertilizer would be of greater value than the single application.

Renovation and Replanting.

The recovery of paspalum pastures even after the first renovation by ploughing may not be satisfactory, particularly if some weeks of dry weather occur soon after treatment. Thus it was advisable to ascertain whether replanting would be of any value in conjunction with mechanical renovation. As mixed pastures are more valuable than single species swards, several grasses and legumes were sown in an exploratory experiment (Appendix IV.).

The area available for the trial comprised 3 acres of grub-infested old paspalum pasture invaded by carpet grass. Ploughing and harrowing were carried out in January, 1937, a disc plough being used. Replanting with four of the grasses was completed in February, but the sowing of the winter-growing grasses and the legumes was left until April. Five grasses—paspalum, purple-topped Guinea (*Panicum maximum* var. *coloratum*), Rhodes, woolly finger grasses (*Digitaria* spp.), a winter-growing grass mixture of Italian rye (*Lolium multiflorum*), Wimmera rye (*Lolium subulatum*), and prairie (*Bromus unioloides*), and five legumes—lucerne, white clover, red clover (*Trifolium pratense*), perennial Korean clover, and annual Korean clover (*Lespedeza striata*)—were planted. Each grass was sown with each of the legumes, each grass alone, and each legume alone. One treatment, of course, comprised renovation without reseeding.

The experimental area of 3 acres was fenced off as one field and grazed periodically by a herd of forty-five dairy cows for two to three hours daily whenever the pasture was at a suitable stage. The

grazing provided during the first year after renovating and replanting was equivalent to two beasts per acre per annum for between two and three hours daily. This is an improvement on the carrying capacity expected of the corresponding unimproved pasture.

Observational results of some value were obtained. The legumes, though germinating, were never strongly established, even where phosphate (22 lb. P_2O_5 per acre) was applied. A few lucerne plants grew, but these were not sufficiently numerous to materially improve the pasture. The Korean clovers were less satisfactory than the lucerne, and reseeding with both early in the summer of 1937-38 failed to establish either species in the sward. Both red clover and white clover failed. The winter grasses succumbed, apparently, to competition by renovated paspalum, which grew particularly well during the mild winter of 1937. All the species of *Digitaria* failed also. *D. eriantha* root sets, to the extent of 50 per cent. of those planted, rooted successfully, but a year later it was impossible to locate any.

There was no obvious indication that reseeding with paspalum improved the renovated pasture. Normally, however, the pasture is left undisturbed for some time after renovation, and this allows natural reseeding before grazing is attempted. The Rhodes grass was very successful, and not only provided a good bulk of feed, but also suppressed the various weeds which always occur in renovated pastures during the first year after treatment.

Purple-topped Guinea grass was sown at the rate of 5 lb. per acre, and although a germination test on the sample showed only 15 per cent. viable seed, the grass is well established in each of the three replications, and appears quite capable of meeting the competition of paspalum. The palatability of this grass is excellent, and it was always grazed off short whenever stock had access to the field. Unfortunately, it is killed back by frost, though coming away again very freely in the spring.

Replanting after Cultivation.

Failure, or at best, only partial success has attended efforts by local farmers to re-establish pastures after the land has been in cultivation for a number of years. These difficulties are probably due to soil-nutrient deficiencies, which can be remedied by the application of suitable fertilizers. It is very desirable that any such re-established pastures should contain at least one legume in association with one or more grasses.

The compatability of several grasses and each of three summer fodder legumes was investigated in a small observation trial (Appendix V.). The three legumes—lucerne, sweet clover (*Melilotus alba*), and annual Korean clover—were sown alone and with each of the following grasses in January, 1938:—Paspalum, Rhodes, woolly finger (*Digitaria Polevansii*), slender Guinea (*Panicum maximum* var. *trichoglume*), and purple-topped Guinea. This provided fifteen two-species mixtures and three legumes alone, all of which were planted in duplicate.

There was very strong competition from weeds over the whole area. All the grasses, except the *Digitaria*, made satisfactory growth, the vigour of Rhodes and the two types of Guinea being quite outstanding. None of the legumes grew well, either with the grasses or alone, until the following summer, but Korean clover appears least promising of the

three. Both lucerne and sweet clover made better growth during the winter than could have been expected from their appearance in autumn, possibly because of good rains in July. It seems that lucerne with either of the Guinea grasses and lucerne with Rhodes grass should make good two-species mixtures for local use.

The establishment of pastures on old cultivation is being investigated in two experiments.

The land used for the first trial had been under various crops for a number of years prior to the winter of 1935, when it was first made available for experimental purposes (Appendix VI.). Cropping results indicated a deficiency in plant foods. The whole field was, therefore, treated with lime and phosphatic fertilizer, and grew various crops, which are described in a later section of this report. Early in 1938 a heavy crop of sorghum and cowpea was ploughed in as green manure, and six weeks later a pasture mixture of lucerne, Rhodes grass, and prairie grass was sown.

Rather dry and unfavourable weather was experienced for some five weeks after sowing, but nevertheless the pasture made good growth. An excellent mixed pasture is now established, but its durability under normal management remains to be determined.

The land used for the second trial had also been in cultivation for a number of years, and showed a marked falling-off in yields of the staple crop—maize (Appendix VII.). Sorghum and Poona pea were grown on the field and ploughed in as green manure early in 1938. A mixture of wheat and lucerne was sown at the end of April, two months after ploughing in the green crop. Both species made excellent growth and, by the time the wheat had been grazed off, the lucerne was well established. The latter made an excellent response to the early storms in November, 1938, and was mown at the end of December. A paspalum and Rhodes grass seeds mixture was then sown, and promises to develop into a good permanent pasture.

LUCERNE.

Clovers have not been very successful in Tableland pastures, the general experience being that they fail within a year or two of sowing, presumably owing to the dry spring usually experienced in the district. The observed better growth of clovers in the moister parts of the Tableland and elsewhere if good rains occur in the spring supports this suggestion. Furthermore, the known deficiency of phosphates in the soils may be important. The available strains of clover are possibly unsuitable, and failure to inoculate with a suitable *Rhizobium* may also be a limiting factor.

In view of the comparative failure of clovers, and the dependability of summer rains on the Tableland, the investigation of summer legumes for pastures is essential. Lucerne is unquestionably the best legume for dairy cattle, and there is no doubt that the more extensive use of this crop is desirable. Very little lucerne has been grown in the Peeramon district of the Tableland in the past, though many unsuccessful efforts to establish the crop have been made. Even when the crop appears to be fairly well established, attacks by the leaf spot fungous disease *Pseudopeziza medicaginus* may cause wholesale spoilage. Furthermore, haymaking is difficult during the summer and autumn in such a moist climate. Nevertheless, these difficulties may not be insurmountable.

Lucerne in Pastures.

The experimental work already described indicated that the incorporation of lucerne in established paspalum pastures was not likely to be accomplished until the local fertilizer requirements of the crop are known.

Lucerne has since been established, however, after thorough cultivation and the addition of lime and phosphates to the soil. Promising grasses to grow in the pasture with lucerne are prairie, Rhodes, slender Guinea, and purple-topped Guinea. The experimental areas (Appendix VI. and VII.) in which lucerne is used as the pasture legume have not yet been sufficiently long established to yield completely reliable data.

Grazing Lucerne.

An experimental area of lucerne was established in the white grub belt at the beginning of 1936 in order to obtain some information on the difficulties associated with the establishment and maintenance of the crop, particularly when grazed as a pure stand (Appendix VIII.). Four acres of old paspalum pasture were ploughed at the end of 1935 and a crop of maize grown for silage. After thorough cultivation following the maize harvest, lucerne, inoculated with the appropriate *Rhizobium*, was sown early in June, 1936. Quicklime ($\frac{1}{2}$ ton per acre) was broadcast in two strips across the field, and superphosphate (33 lb. P_2O_5 per acre) applied in strips at right angles to the limed strips. There was no visible effect attributable to the lime, but the effect of phosphate was so marked that superphosphate has since been applied to the whole field annually.

The 4 acres are now subdivided into three fields approximately equal in area, and these are grazed off quickly in turn when the lucerne makes sufficient growth for the purpose. The herd, comprising about forty-five head of dairy cows, is used for grazing, the animals being allowed access to one field for one to two hours daily until the lucerne is eaten short. They are then placed in the second field, and finally into the third, each field being grazed in a similar manner to the first. The whole area is allowed to recover before grazing is again attempted.

This system of grazing has been practised since the end of 1936, and a satisfactory stand of the crop still persists on about half the field. It is noticeable that the lucerne is being crowded out by weeds and paspalum on the higher parts of the slope, but on the more level portion it still comprises about 80 to 90 per cent. of the herbage. The field was mown in March, 1937, to control an outbreak of *Pseudopeziza* leaf spot.

Increased cream production while the herd is grazed on the lucerne indicates that the crop is worth about £20 per acre per annum to the farmer. The fact that the crop has persisted for so long under harsh treatment indicates that successful exploitation should be quite practicable, even if resowing every three years is necessary.

Lucerne Silage.

It may not always be convenient or practicable to graze lucerne, and the conservation of any surplus supplies for use during the dry spring is clearly desirable. The weather during the summer, when lucerne grows most rapidly, is often unsuitable for haymaking,

on account of the extended wet periods which sometimes occur. The feasibility of conserving lucerne as silage was therefore investigated. The A.I.V. method, using mineral acids, is too expensive for local application, but the molasses modification is quite practicable, as supplies of the latter can be obtained from the sugar-cane districts near by.

In the absence of a suitable small silo for the purpose, a 44-gallon iron petrol drum was used. The lucerne was chaffed immediately after cutting, mixed with a solution containing equal volumes of molasses and water, at the rate of 1 gallon molasses solution to 100 lb. green lucerne, and then packed into the drum.

Three months after treatment, the seal was removed. Some 6 inches of the material at the top of the drum had rotted, but otherwise the silage was in good order. The cured silage appeared too moist and possibly too acid, but these disadvantages would be at least partially overcome by using less molasses, say, about 4 lb. per 100 lb. green lucerne. Chemical analysis of the silage showed that the values of nutrient materials compare favourably with those of green lucerne (Table II.).

TABLE II.

ANALYSES OF LUCERNE-MOLASSES SILAGE AND OF GREEN LUCERNE.

Determination.	Lucerne-Molasses Silage (Atherton).	Green Lucerne (Atherton).	Green Lucerne (U.S.A.).*
Water	75·36	73·53	74·60
Crude Protein	4·66	6·13	4·6
Crude Fat	0·52	0·40	1·0
Carbohydrate	10·20	10·90	10·4
Crude Fibre	5·96	6·13	7·0
Crude Ash	3·30	2·90	2·4
CaO	0·550	0·622	0·40
P_2O_5	0·062	0·148	0·06

* Figures quoted from "Feeds and Feeding" (Morrison, 1936).

Thus the local application of the molasses method of making lucerne silage is apparently quite practicable and will be valuable when more lucerne is grown.

FODDER CROPS.

The drop in butter production for the district during the dry spring and early summer indicates that the roughage then available contains insufficient nutriment for dairy cattle. It is sometimes possible to grow winter cereals for grazing early in the spring, but favourable growing weather does not always occur. Even during those years when winter crops can be grown there is still the probability of the dry season continuing long after the winter crops have been fed off. Winter cereals on the Tableland are also very susceptible to rust under the normal climatic conditions in winter. There may be some years in which winter crops could be grown for hay, but their occurrence is always problematical. However, even in 1915, the driest year recorded on the Atherton Tableland, there was sufficient summer rain to ensure the growth of summer fodder crops such as maize, sorghum, or cowpeas. Therefore, the logical procedure is to concentrate on the growth of

summer fodders for conservation, and to recognise winter cereals as desirable but not dependable crops under local climatic conditions.

Good haymaking weather is extremely rare during the late summer; thus it is advisable to concentrate attention on good silage crops rather than on those summer crops particularly adapted for conservation as hay. Maize is the best crop for silage, and receives preference over all others wherever it can be grown. Sorghum is second favourite as a silage crop, and heavy yields are produced in some districts.

Silage Crops.

The few farmers who have hitherto made silage on the Tableland have grown maize alone for the purpose. Maize provides a great bulk of fodder under suitable conditions of soil and climate, but the nutritive ratio is much wider than that required by dairy cows in a supplement to the poor pasturage in spring and early summer. There is not sufficient protein to balance the carbohydrates and fat. Maize silage has a sufficiently high content of digestible nutrients to keep milking cows in good condition, but a ration of maize silage and pasture must be supplemented by appreciable quantities of protein concentrates in order to maintain the herd's butterfat production at a profitable level. Suitable concentrates such as bran, cottonseed meal, and linseed meal are comparatively expensive and difficult to obtain on the Atherton Tableland. It is, therefore, sound economy to produce as much as possible of the proteins required on the farm itself. This is desirable in any district, of course, but it is more necessary on economic grounds in North Queensland than in most other districts of the State.

The protein content of all fodder legumes is high, but most of them do not produce a high yield of dry matter per acre when grown alone. In many dairying districts, in Australia and in other countries, farmers have adopted a practice of growing maize and a legume together for silage. Both crops are planted at the same time, in the same drill, and the combined crop is harvested and made into silage in the one operation. In an American experiment, a combined crop of maize and soy bean increased the dry matter yield per acre by as much as 14 per cent., compared with the yield from maize alone. In this connection, Wiggins (1935) states that "Any good variety of silage corn and a suitable variety of soy beans, grown together in the same row and spaced at the rate of one corn plant to three soy bean plants in each nine inches of row, yield more digestible nutrients than does the same variety of corn grown alone at the optimum planting rate."

Thus, the investigation of maize-legume combined crops for local conditions should indicate one or more mixtures capable of yielding silage rich in digestible nutrients and with a suitable nutritive ratio. Some strains of maize developed on the Tableland by individual farmers are known to outyield all other commercial varieties in the district. Local maize types were, therefore, given first preference in maize-legume silage experiments. Heavy yields of sorghum have sometimes been obtained locally, and attention has also been given to this crop.

The legumes must fulfil certain conditions if they are to be suitable for combination with either of the other crops. They should reach silage maturity at the same time as the associated variety of sorghum or maize; increase the production of dry matter per acre; increase the percentage of protein in the total dry matter; and grow in such a manner that harvesting with either maize or sorghum is easily performed.

Maize, Poona pea (*Vigna sinensis*), and rice bean (*Phaseolus calcaratus*) were included in the silage-cropping programme in 1936-37. (Appendix VI.). All crops were planted at the same time, and the maize required approximately sixteen weeks to reach silage maturity. Poona pea matured in a shorter period, and was dead when the maize


(a)

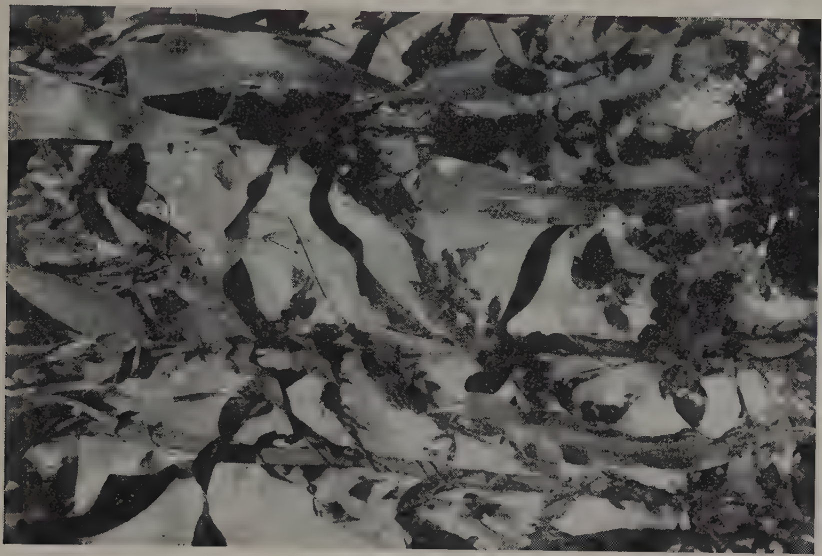

(b)

Plate 228.

SILAGE CROPS.—(*a*) Sorghum and Groit cowpea; (*b*) maize and rice bean.

was ready for the silo. Rice bean synchronised very will with the maize and was heavily loaded with green pods at the time of harvesting (Plate 228). Unfortunately, however, the bulk of the crop produced by the rice bean was inconsiderable (Table III.), and quite insufficient to warrant its use with maize unless the proportion of legume can be increased by variations in rates of planting or by some other means.

The effects of variations in rates of planting maize and rice bean were investigated (Appendix IX.) on another farm. Both maize and rice bean were sown in the same drill on the same day and duplicate plots of six spacing variations were sown. The maize was quite ready to harvest fifteen weeks after sowing, though the rice bean had not then commenced flowering. In the earlier experiment, the rice bean had been ready to harvest with the maize approximately sixteen weeks after sowing. Although there was considerable variation in the amount of rice bean in the variously planted plots—from 1·28 per cent. to 5·06 per cent.—the legume content in the combined fodder was never sufficiently high to materially improve the nutritive ratio of the silage (Table IV.). It is remarkable that, with so much variation in rate of planting, there was no significant variation in total yield of green material from treatment to treatment.

The failure of the maize and rice bean to synchronise as well in the second experiment as they did in the first may have been due to variable weather from season to season, soil differences between the two farms, and differences in the strains of maize or rice bean used in the experiments.

The values of rice bean, Groit cowpea, giant cowpea, and Otootan soy bean as legumes for use in combination with maize for silage were investigated in another experiment (Appendix X.). The crops were sown in limed (3 tons ground limestone per acre) soil, and a complete fertilizer (18 lb. 6 ;. 54 lb. P_2O_5; 26 lb. K_2O) was applied in the drill at the time of planting. The drills were 3½ feet apart. The maize was sown as single grains 9 inches apart, and the legumes at the rate of 10 lb. per acre. Each of the legumes, except rice bean, was inoculated with the appropriate *Rhizobium* before planting. Duplicate plots were sown. Dry weather for some time after planting probably depressed yields and hastened maturity, for the crops were ready for harvesting fourteen and a-half weeks after sowing. Yields are recorded in Table V.

The yield of rice bean was not materially greater than in the spacing trial previously discussed. The yield of giant cowpea—3 tons green weight per acre—was qhite satisfactory, and comprised, roughly, 23 per cent. of the total green weight of the combined crop. Both soy bean and Groit cowpea—particularly the latter—synchronised well with the maize, and the nutritive ratio of the mixed crop was much better than that of the maize alone (Tables VI. and VII.).

A comparison of Groit cowpea and velvet beans for combination with maize was made on one farm independently of this investigation. These crops were fertilized with superphosphate only. Both mixtures handled well and contained fairly high percentages of legumes. The green weight of Groit cowpea was much higher than that of velvet bean, but there was not so much disparity in total nutrients per acre (Table VII.).

TABLE III.

SILAGE CROP, 1936-1937.

Treatments.	Sub. Block.	Yield Green Weight—Tons per Acre.			Percentage Legume.
		Total.	Maize.	Rice Bean.	
a	1	9·82	9·13	0·29	3·08
	2	6·89	6·85	0·04	0·58
	3	8·07	7·84	0·23	2·85
	4	10·32	10·04	0·28	2·71
	Mean ..	**8·66**	**8·45**	**0·21**	**2·42**
b	1	12·32	11·11	1·21	9·82
	2	14·00	13·39	0·61	4·36
	3	12·35	12·00	0·35	2·83
	3	13·92	13·40	0·52	3·74
	Mean ..	**13·15**	**12·48**	**0·67**	**5·10**
c	1	10·24	9·92	0·32	3·13
	2	15·06	14·19	0·87	5·78
	3	10·65	10·44	0·21	1·97
	4	8·35	8·18	0·17	2·04
	Mean ..	**11·08**	**10·69**	**0·39**	**3·52**
d	1	4·64	4·61	0·03	0·65
	2	6·26	6·20	0·06	0·96
	3	3·99	3·96	0·03	0·75
	4	3·10	3·05	0·05	1·61
	Mean ..	**4·49**	**4·45**	**0·04**	**0·89**
General Mean		9·35	9·02	0·33	3·53

Treatments (per acre)—

(*a*) Superphosphate at 75 lb. P_2O_5.

(*b*) Quicklime at 2 tons.
Dried blood at 25 lb. N.
Superphosphate at 75 lb. P_2O_5.
Sulphate of potash at 30 lb. K_2O.

(*c*) Quicklime at 2 tons.
Meatworks manure at 54 lb. P_2O_5 and 16 lb. N.

(*d*) No fertilizer or lime.

TABLE IV.

YIELDS FROM MAIZE-RICE BEAN SILAGE CROP, 1938.

Treatments (Rates of Planting).		Plot.	Yield—Tons Green Fodder per Acre.			Per cent. Legume.
			Total.	Maize.	Legume.	
A	Rows 4 ft.	1 ..	14·436	14·24	0·196	1·38
	Maize 9 in.	2 ..	12·750	12·48	0·270	2·13
	Bean 6 lb.	Mean ..	**13·593**	**13·36**	**0·233**	**1·74**
B	Rows 4 ft.	1 ..	13·776	13·26	0·516	3·89
	Maize 9 in.	2 ..	14·167	13·75	0·417	3·03
	Bean 8 lb.	Mean ..	**13·972**	**13·50**	**0·467**	**3·46**
C	Rows 3 ft.	1 ..	14·373	13·62	0·753	5·53
	Maize 9 in.	2 ..	14·734	14·21	0·524	3·68
	Bean 10 lb.	Mean ..	**14·554**	**13·91**	**0·639**	**4·59**
D	Rows 3 ft.	1 ..	14·600	13·88	0·720	5·18
	Maize 12 in.	2 ..	14·797	13·88	0·917	6·60
	Bean 10 lb.	Mean ..	**14·700**	**13·88**	**0·818**	**5·89**
E	Rows 3½ ft.	1 ..	15·492	15·38	0·112	0·73
	Maize 3 @ 1½ ft. ..	2 ..	13·644	13·42	0·224	1·67
	Bean 10 lb.	Mean ..	**14·568**	**14·40**	**0·168**	**1·17**
F	Rows 4½ ft.	1 ..	14·367	13·93	0·437	3·14
	Maize 6 in.	2 ..	14·518	14·06	0·458	3·26
	Bean 10 lb.	Mean ..	**14·443**	**14·00**	**0·448**	**3·20**
All Treatments		..	**14·302**	**13·84**	**0·462**	**3·34**

N.B.—All maize was sown as single grains except in E, where maize was planted in three grain groups.

TABLE V.

YIELDS FROM MAIZE-LEGUME SILAGE CROPS, 1937-1938.

Treatments.	Plot.	Yield—Tons Green Fodder per Acre.			Per cent. Legume.
		Total.	Maize.	Legume.	
A	1	11·05	10·21	0·84	7·60
	2	9·99	8·87	1·12	11·21
	Mean ..	**10·52**	**9·54**	**0·98**	**9·32**
B	1	13·02	10·27	2·75	21·12
	2	13·11	9·85	3·26	24·86
	Mean ..	**13·07**	**10·06**	**3·01**	**23·03**
C	1	13·80	10·66	3·14	22·75
	2	11·68	7·58	4·10	35·10
	Mean ..	**12·74**	**9·12**	**3·62**	**28·42**
D	1	10·05	9·15	0·90	8·96
	2	8·08	6·62	1·46	18·07
	Mean ..	**9·07**	**7·89**	**1·18**	**13·02**
All Treatments	..	**11·35**	**9·15**	**2·20**	**19·38**

Treatments—

A. Maize, single grains 9 in. apart; rice bean 10 lb. per acre.
B. Maize, single grains 9 in. apart; giant cowpea 10 lb. per acre.
C. Maize, single grains 9 in. apart; Groit cowpea 10 lb. per acre.
D. Maize, single grains 9 in. apart; Ootootan soy bean 10 lb. per acre.

TABLE VI.

ANALYSES OF SILAGE CROPS GROWN IN 1937-1938.*

Determination.	Maize.†	Maize.‡	Soy Bean.	Rice Bean.	Velvet Bean.	Groit Cowpea.
Percentage analysis of green crops.						
Moisture ..	52·97	55·10	70·73	77·95	63·22	80·82
Dry Matter ..	47·03	44·90	29·27	22·05	36·78	19·18
Carbohydrate	29·87	26·45	12·07	8·98	15·05	8·68
Fibre	10·96	12·20	8·03	7·40	11·70	5·86
Fat	1·35	0·70	1·67	0·50	0·92	0·33
Protein ..	3·24	3·95	5·73	3·78	7·06	3·03
Ash	1·62	1·60	1·77	1·40	2·05	1·28
Percentage analysis of dry matter only.						
Protein ..	6·86	8·80	19·59	17·12	19·20	15·84
Fat	2·87	1·56	5·70	2·27	2·50	1·70
Fibre	23·31	27·17	27·45	33·56	31·82	30·55
Carbohydrate	63·50	58·90	41·23	40·70	40·90	45·23
Ash	3·46	3·57	6·04	6·35	5·57	6·67
CaO	0·46	0·67	2·05	2·72	1·93	1·92
P_2O_5	0·22	0·27	0·43	0·36	0·42	0·41

* These analyses are based on material growing in the experimental plots or in the farmers' own crops adjacent to such plots.

† Grown with superphosphate.

‡ Grown with a complete fertilizer.

TABLE VII.

TOTAL NUTRIENTS IN SILAGE CROPS GROWN IN 1937-1938.*

Fertilizer.	Crops.	Tons per Acre.	Starch Equivalent. (Cwt.)	Crude Proteins. (Cwt.)	Total Nutrients. (Cwt.)	Nutritive Ratio : 1.
Superphosphate only ..	Maize ..	8·250	72·35	5·35	77·70	13·5
	Vel. bean ..	1·142	6·58	1·62	8·20	4·1
	MIXTURE	**9·392**	**78·93**	**6·97**	**85·90**	**11·32**
Superphosphate only ..	Maize ..	7·632	66·93	4·95	71·88	13·5
	Groit Cowpea ..	3·087	9·43	1·87	11·30	5·0
	MIXTURE	**10·719**	**76·36**	**6·82**	**83·18**	**11·20**
Complete fertilizer plus lime	Maize ..	9·120	73·30	7·20	80·50	10·2
	Groit Cowpea ..	3·620	11·10	2·20	13·30	5·0
	MIXTURE	**12·740**	**84·40**	**9·40**	**93·80**	**8·98**
Complete fertilizer plus lime	Maize ..	7·88	63·40	6·22	69·62	10·2
	Soya bean..	1·18	5·63	1·35	6·98	4·2
	MIXTURE	**9·06**	**69·03**	**7·57**	**76·60**	**9·12**

* Data based on material growing in the experimental plots or in the farmers' own crops adjacent to such plots.

It is possible to suggest from the results of these experiments the trend of future developments, and to indicate the possibilities of some legumes in combination with maize for silage. Giant cowpea grows well, but matures later than maize. Furthermore, this legume is entirely procumbent, and therefore quite unsuitable for harvesting with maize for silage. Rice bean yields in the combined crop are low and, unless they can be improved by cultural or other means, this legume is unlikely to be of any value for silage purposes. Velvet bean, although not included in the experimental trial, showed promise when grown by a farmer. Groit cowpea combines very well with maize, and has yielded nearly 29 per cent. by weight of the green crop and over 10 cwt. of total nutrients per acre (Table VII.). Otootan soy beans grown with maize, though producing only 13 per cent. of the total green weight in the mixture, yielded almost 7 cwt. of total nutrients per acre (Table VII.) and improved the nutritive ratio of the silage appreciably. Soy beans are successfully combined with maize for silage overseas, and suitable varieties may ultimately be established here.

The nutritive ratio (approximately 11 : 1) of the green materials grown with superphosphate only was retained in the silage (Table VIII.). The analysis of maize grown on limed soil with a complete fertilizer shows a much higher percentage of protein than that of maize grown with superphosphate only (Table VI.). The latter crop was planted ten days before the former, and had the advantage of more favourable weather conditions at planting time.

TABLE VIII.

COMPARATIVE ANALYSES—GREEN MATERIAL AND SILAGE.*

Foodstuff.	Material.	Moisture.	Dry Matter.	Carbo-hydrate.	Fibre.	Fat.	Protein.	Ash.	Nutritive Ratio.
Maize and Velvet Bean	Green ..	54·21	45·79	28·10	11·12	1·30	3·70	1·67	11·32
Maize and Velvet Bean	Silage ..	68·53	31·47	20·74	6·48	0·63	2·46	1·16	11·64
Maize and Groit Cowpea	Green ..	60·95	39·05	23·76	9·49	1·06	3·17	1·51	11·20
Maize and Groit Cowpea	Silage ..	71·24	28·76	17·72	7·05	0·55	2·30	1·15	11·31
Mean	Green ..	57·58	42·42	25·93	10·31	1·18	3·44	1·59	11·26
Mean	Silage ..	69·89	30·12	19·23	6·77	0·59	2·38	1·16	11·48

* These analyses are based on material growing in the experimental plots or in the farmers' own crops adjacent to such plots.

Sorghum has been grown with legumes on several occasions during the past three years, but these mixed crops have not been made into silage. Only one variety of sorghum (red Kaffir) has been used, as this type is reputed to be more rust-resistant locally than the considerable number of others which were grown experimentally in North Queensland between ten and fifteen years ago.

Sorghum was grown with Poona pea on two occasions. In the first trial (Appendix VI.) the mixed seed was sown in drills 3 feet apart. The crop reached silage maturity in eleven weeks, and the maximum yield was 11·7 tons per acre, comprising 9·1 tons sorghum and 2·6 tons Poona pea. In the second trial (Appendix VII.) the mixed seed was sown through a wheat drill and ploughed in as green manure nine and

a-half weeks after sowing. The sorghum was about three weeks off and the Poona pea about a week off silage maturity when ploughed in. The total green weight per acre then varied from 12 to 19 tons, with a mean of 14 tons, and the two components were present in approximately equal amounts by weight.

The sorghum was grown with Groit cowpea on one occasion, and was also ploughed in as green manure ten weeks after sowing (Appendix VI.) when both components of the mixed crop were some weeks off silage maturity (Plate 228). A number of sample cuttings indicated a green crop weighing just over 13 tons per acre comprising 53 per cent. cowpea.

Chemical analyses of any of these sorghum-cowpea mixed crops are not available, but it is quite obvious from the figures quoted that high yields of green materials can be obtained. The nutritive ratio of a 50-50 sorghum-cowpea crop would be approximately 6·6 : 1, calculating from the sorghum analysis given by Morrison, 1936, and Groit cowpea analysis in Table VI., and further investigations of sorghum-cowpea mixed crops for silage are warranted.

Maize for Grain.

Very little attention has been given to maize as a grain crop during these investigations, though it plays a definite part in local dairying practice as a valuable carbohydrate concentrate for both dairy cattle and pigs.

The Atherton Tableland is probably the most reliable maize-producing area in Queensland (Annual Reports, Department of Agriculture and Stock), but grain yields are not uniformly satisfactory throughout the district. Considerable difficulty has been experienced by dairy farmers attempting the growth of maize in the wetter areas, and on many of these farms the production of good crops has been impossible. Some experiments with fertilizers on grain yields of maize are described in a later section of this report. These indicate that phosphatic fertilizers will greatly enhance the chances of obtaining good crops, particularly when the wet season is not sufficiently prolonged to cause serious damage by cob rot (*Diplodia zeæ*). The rice weevil (*Calandra oryzæ*) is the only insect pest of any importance to the stored grain locally, but standard methods of controlling this pest are effective.

Fodder Crops and Fertilizers.

Sorghum was one of the first cultivated fodder crops planted at the inception of these investigations. The yield of green material for silage obtained was only about 3 tons per acre (Appendix VI.) and the crop was a commercial failure. Germination of the seed was not at fault, and the rainfall should have been sufficient for the crop. There was no indication of damage by insect pests or diseases. Therefore, it was assumed that the crop failure was in some way associated with a soil factor, though whether a plant-food deficiency, faulty physical condition, or some deleterious substance was uncertain.

Crop failure was not uniform over the whole field (Plate 229) for, although there were large patches in which seedlings failed to develop past that stage, there were others in which the crop grew well. To distinguish between these areas and to facilitate discussion, they are hereinafter referred to as "bad patches" and "good patches" respectively. The location of good and bad patches over the whole western

half of the field was carefully plotted by recording the growth made in fifty-six quadrats, each covering about 100 square feet. The quadrats were regularly spaced—17 yards apart from north to south and 11 yards apart from east to west. A numerical value, between 0 and 10, was allotted to the growth made in each quadrat—allocation of the value being made from judgment only, and not from weighed production. The value 0 represents complete failure where the plants died after reaching a height of 3 or 4 inches, and 10 represents satisfactory growth (Plate 230). The obvious variability in growth from quadrat to quadrat is far in excess of that normally encountered in field uniformity trials and suggests that some factor other than chance was responsible for the good and bad patches in the area.

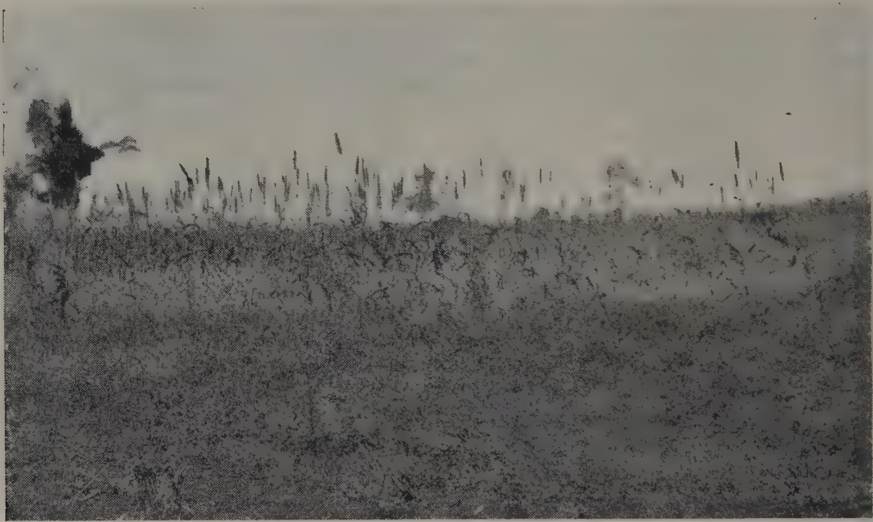


Plate 229.

INITIAL SORGHUM CROP AT PEERAMON, SHOWING "GOOD" AND "BAD" PATCHES THE LATTER IN THE FOREGROUND.

Four composite soil samples were collected from this field for chemical analysis. Two of the samples were taken from the northern end, one representing good-patch soil to a depth of 6 inches from three sites, and the other representing bad-patch soil taken similarly. Similar methods of sampling were used to collect good-patch and bad-patch soils from the southern end of the field.

The chemical and physical analyses of these samples indicate several striking differences between the soils. The most obvious difference is that the bad-patch soils are considerably more acid (pH 4·5) than the good-patch soils (pH 5·5). This difference is probably linked with the fact that bad-patch soils contain less lime (CaO), less magnesium (MgO), and less potash (K_2O) than the good-patch soils (Table IX.). The bad-patch soils contain more nitrogen (0·266 per cent.) than the good-patch soils (0·236 per cent.); this might also be linked with the lower pH value through the effect of the latter partially controlling the destruction of organic matter by micro-organisms in the soil. On the other hand, it might be linked with the greater proportion of colloidal

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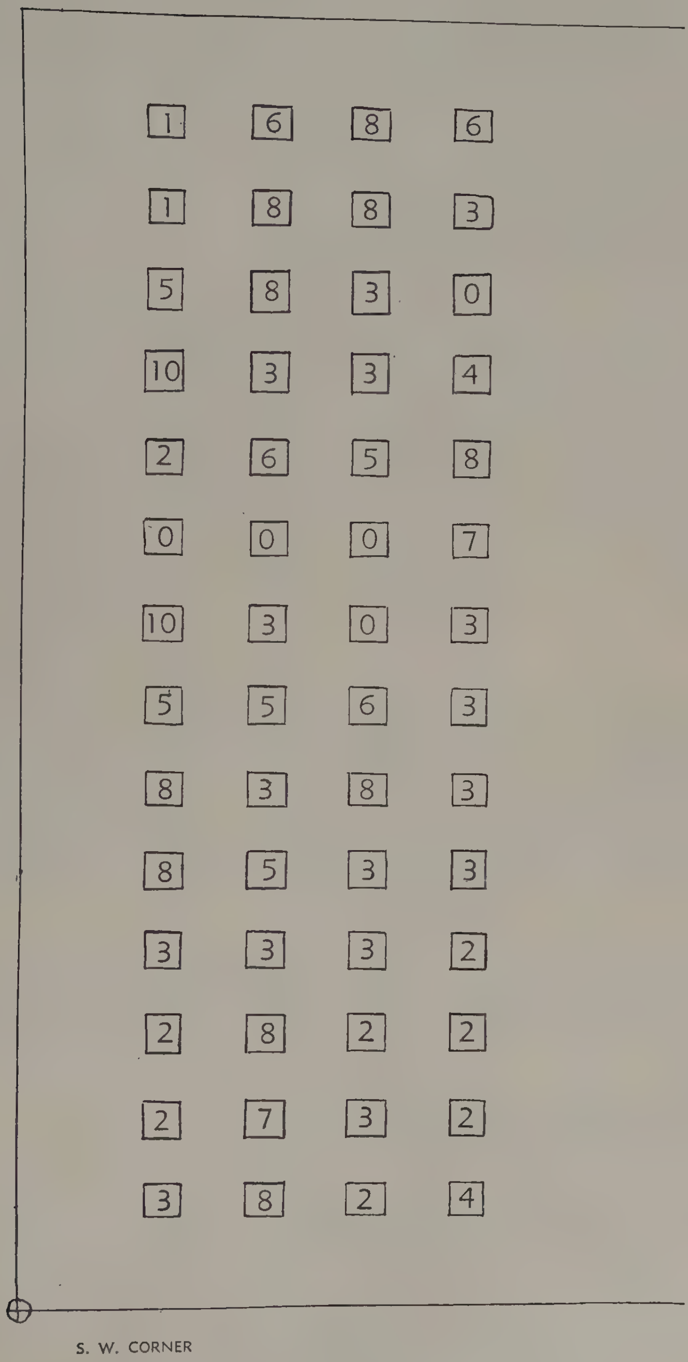

Plate 230.

materials in the bad-patch soils. The content of phosphates is very low in both types of soil, but whereas the content of HCl soluble P_2O_5 is approximately the same in each (0·15 per cent. and 0·14 per cent.), the citric acid soluble P_2O_5 is higher in the bad-patch soils (0·0051 per cent. and 0·0031 per cent.). The mechanical fraction sand plus silt is higher (42·9 per cent.) in the good-patch soils than in the bad-patch soils (28·4 per cent.)—these portions can be described as inert material. The remainder, or colloidal materials, including fine silt, clay, and organic matter, comprise 57·1 per cent. and 71·6 per cent. in the good-patch and bad-patch soils respectively.

TABLE IX.

ANALYSES OF COMPOSITE SOIL SAMPLES FROM GOOD PATCHES AND BAD PATCHES (PEERAMON).

Determination.	"Good Patch" Soil.*			"Bad Patch" Soil.†		
	A.	B.	Mean.	A.	B.	Mean.
pH	5·7	5·2	5·5	4·6	4·4	4·5
Specific Gravity	1·13	1·13	1·13	1·13	1·11	1·12
Capacity for Water (%)	48	54	51	48	53	51
Capill. inches—						
3 hrs.	7	11·25	9·13	9·5	7·75	8·63
6 hrs.	9	13	11	10·5	8·25	9·38
12 hrs.	14	16	15	14	11·75	12·88
24 hrs.	16·25	17·5	16·88	15	14	14·5
Percentage in air-dried Soil.						
Moisture	5·09	4·86	4·98	4·75	5·17	4·96
Humus	2·66	2·52	2·59	2·69	2·55	2·62
Loss on Ignition	12·80	13·13	12·97	12·27	12·80	12·54
Nitrogen	0·236	0·235	0·236	0·265	0·266	0·266
HCl soluble P_2O_5	0·13	0·16	0·15	0·14	0·14	0·14
Citric Soluble P_2O_5	0·0033	0·0028	0·0031	0·0052	0·0050	0·0051
HCl sol. Fe, Al, Mn.	35·92	38·76	37·34	37·04	36·59	36·82
HCl soluble Ca?	0·39	0·26	0·33	0·19	0·12	0·16
Citric soluble CaO	0·1929	0·1118	0·1474	0·0165	0·0183	0·0174
HCl soluble K_2O	0·23	0·05	0·04	0·02	0·02	0·02
Citric soluble K_2O	0·0106	0·0094	0·01	0·0118	0·0091	0·0105
Mechanical Analysis.						
Sand 0·04–2·0 mm.	31·5	21·9	26·7	17·1	15·2	16·2
Silt 0·01–0·04 mm.	15·5	16·9	16·2	13·6	10·8	12·2
Fine Silt 0·002–0·01 mm.	23·3	31·8	27·6	28·2	29·0	28·6
Clay—under 0·002 mm.	14·1	13·7	13·9	26·1	29·6	27·9
Organic Matter	15·5	15·7	15·6	15·0	15·4	15·2

* Soil growing good crops without fertilizer.
† Soils in which crops failed wholly or partially.

During the spring following the failure of sorghum as a field crop some pot experiments were conducted with soil from both good and bad patches. As a shortage of the exchangeable bases—lime, magnesia, and potash—coupled with high acidity, was associated with the bad patches, and as the total phosphate was low throughout the field, the effect of added lime and phosphate to both types of soil in pots was investigated. The effect of added organic matter as goat dung in addition to lime was also investigated, sorghum being used as the test crop.

The results of the experiments provided some very suggestive data:—

(1) Bad-patch soils.—Air-slaked quicklime at 1 to 4 tons per acre effected an improved growth roughly proportional to the rate of application. Superphosphate at 120 lb. P_2O_5 per acre improved growth to much the same extent as meatworks manure at 100 lb. P_2O_5 and 30 lb. N per acre. Organic matter in the form of 10 tons goat dung per acre with air-slaked quicklime at 4 tons per acre improved growth to a remarkably high level.

(2) Good-patch soils.—Air-slaked quicklime at 4 tons per acre effected some improvement, and the same quantity of lime together with superphosphate at 120 lb. P_2O_5 per acre effected slightly greater improvement. The effects of lime and phosphates on these soils were not so marked as were the effects of the same materials on soil from bad patches.

The suggestions obtained from the above pot experiments were incorporated in a field trial of silage crops during the 1936-37 summer (Appendix VI.). The field was divided into four equal blocks for the application of lime and fertilizers. Poona pea, sorghum and Poona pea, and maize with rice bean were strip-planted across the blocks.

Lime and fertilizer treatments comprised the following:—

(*a*) Superphosphate at 75 lb. P_2O_5 per acre;

(*b*) Quicklime at 2 tons, superphosphate at 75 lb. P_2O_5, dried blood at 25 lb. N, and sulphate of potash at 30 lb. K_2O per acre;

(*c*) Quicklime at 2 tons, meatworks manure at 54 lb. P_2O_5, and 16 lb. N per acre;

(*d*) No fertilizer treatment.

Representative yields from the maize-rice bean strip were obtained by cutting four rows from each of the four blocks when the crop had matured for silage. The yields obtained expressed in tons per acre are reproduced in Table III. Certain conclusions are suggested tentatively from the figures in the table: (1) The greatest effect is due to phosphates; (2) the effects of nitrogen and potash are small; (3) the effect of lime is considerable, though not so great as the effect of phosphate.

The use of phosphates on maize for silage and for grain was extended in the white grub infested area during the 1937-38 summer season. Good crops were grown with phosphates on three farms in addition to the one containing the experimental area just described (Plate 231). Two of the crops were matured for grain, and the other comprised maize and legumes for silage.

Phosphates were applied on one farm to three different fields, two of which had been cropped with maize for various periods. Treatments comprised either 50 lb. P_2O_5 as superphosphate or 40 lb. P_2O_5 and 11 lb. N as meatworks manure per acre. The results (Table X.) clearly indicate that the addition of phosphates increases the yield of grain irrespective of the length of time the land has been in cultivation. There appears to have been very little difference in yields obtained from either of the fertilizer treatments, but the yield in bushels per acre after fertilizer compared with yield from untreated sections, given in parentheses, after eight years' cultivation 27·4 (11·5), after four years' cultivation 29·0 (12·7), and the first crop after grass 71·4 (49·5) demonstrates conclusively that the addition of phosphate pays.

(*a*)

(*b*)

Plate 231.

MAIZE AT PEERAMON.—(*a*) Without phosphate; (*b*) with phosphate.

TABLE X.

MAIZE GRAIN YIELDS AFTER APPLYING PHOSPHATE COMPARED WITH YIELDS FROM UNFERTILIZED LAND.

Treatments.		Number of Plots.	Mean Yield Bushels per Acre.	*D. zeæ* Loss Bushels per Acre.	Per cent. Loss.
A	Untreated	2	11·5	9·1	44
	Meatworks	2	27·5	19·0	41
	Superphosphate ..	1	27·3	14·9	35
B	Untreated	3	12·7	12·8	50
	Meatworks	4	29·0	9·6	25
	Superphosphate ..	1	28·8	14·8	34
C	Untreated	3	49·5	1·3	2·5
	Meatworks	2	71·4	0·7	1·0

A. Eighth successive maize crop after pasture.
B. Fourth successive maize crop after pasture.
C. First maize crop after pasture.

N.B.—Meatworks at 2 cwt. per acre—i.e., 11 lb. N, 40 lb. P_2O_5.
Superphosphate at 2 cwt. per acre—i.e., 50 lb. P_2O_5.

The yield figures are here reduced to a level of 14 per cent. moisture, allowing 56 lb. to a bushel.

When harvesting the plots to obtain figures for yields from the various treatments, some attention was also given the percentage of ears affected with *Diplodia zeæ*, a common cob rot in the district. The depression of the potential yield caused by this disease was afterwards calculated (Table X.). It is interesting to note that losses tended to be less on fertilized sections, and that such losses increased enormously after the land had grown maize crops successively for a number of seasons.

SUMMARY AND CONCLUSIONS.

On farms which have been established thirty to forty years on the Atherton Tableland, the carrying capacity of pastures was at least 100 per cent. greater during the first ten years after felling, clearing, and grassing than it is at the present time. Paspalum is the dominant grass in this district.

Storms and monsoonal rains are assured during the summer and always provide sufficient moisture for the growth of summer crops. A dry season of three to five months' duration can generally be expected between July and November.

Enormous numbers of white grubs—larvæ of the Scarabæid beetle *Lepidiota caudata* Blkb.— infest many old pastures in the Peeramon district and destroy all of the grass roots to within 1 to 2 inches of the surface. This activity is greatest just before winter, and accentuates the shortage of feed during the dry season.

There are thus two factors reducing the productivity of pastures in the Peeramon district during the winter and spring—the dry season, which affects almost all farms alike, and the white grubs, whose

incidence varies from farm to farm and even from field to field within the farm. Pastures produce little or no feed in areas of heavy grub infestation during the dry season.

p. 487 Most pastures have not been cleared of tree trunks and stumps, nor have the fields, generally, been sufficiently subdivided to permit rotational grazing.

The more readily available clovers have been widely sown, but white clover is the only type to become established, though its distribution is very erratic and it normally fails during the dry season. Prior to this investigation no one had established and maintained a stand of lucerne in the Peeramon district for more than one year, though odd plants had flourished for many years.

Maize has not generally grown well after pasture in the white grub area, except perhaps for a year or two, even where the soil was free of white grubs. Cowcane was, until recently, the only crop grown successfully as a fodder reserve for the dry season, though its cream-producing properties are inadequate. Winter cereals seldom provide feed after August, when fodder supplies are at a minimum owing to the dry weather prevailing then.

Several chemical analyses of soils from the grub-infested area
491 indicate soil acidities ranging from pH 4·5 to pH 6·0. "Bad patches"—i.e., areas showing poor growth of cultivated crops—are associated with high acidity and deficiencies of lime, phosphate, potash, and magnesium in the Peeramon district. Fertilizers were seldom, if ever, used in the area prior to the investigations described in this report.

Previous experience supported by these investigations emphasises the fact that white grubs are not solely responsible for the deterioration of pastures in the Peeramon district of the Atherton Tableland. It appears that soil deterioration inevitably follows the destruction of rain-forest which must precede agricultural development in the humid tropics,, and thus the local menace of white grubs must be regarded in its true perspective as but one aspect of a complex agricultural problem. White grub injury by *Lepidiota caudata* larvæ in the Peeramon district of the Tableland appears to be confined to pastures. No direct attack on cultivated crops has been recorded.

The control of white grubs in pastures by the application of insecticides or by the use of light traps is not practicable. Some relief may be obtained by encouraging predators such as the Giant American
488 Toad (*Bufo marinus*), which has been introduced in considerable numbers from the adjoining coastal sugar-cane fields, for, although the altitude may inhibit breeding, some introduced individuals have survived the Tableland climate for over a year. Enormous numbers of beetles are destroyed by pigs if the latter are given free range over pastures during the beetle flight season. To take advantage of the protection from grub
489 injury afforded by pigs, all boundary and cultivation fences should be pig-proofed either with additional barbed wires or with pig netting. Thereafter the farm should be so managed that immature baconers are available throughout the season in which beetle flight can be expected.

The reduced carrying capacity of deteriorated or grub-infested pastures must be offset by changed methods of farm management. Every effort should be made to remove all the dead timber which, acting as centres for the concentration of beetles immediately before egg-laying,

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is a menace to pastures. The existing large paddocks on many farms would provide much better grazing if cut into smaller fields of 5 to 10 acres, which would permit rotational grazing. Old grub-infested and unprofitable paspalum pastures can be reinvigorated temporarily by ploughing, preferably with mouldboards. The productivity of such renovated pastures can be increased by seeding with Rhodes grass, slender Guinea, or purple-topped Guinea during the wet season when renovation is completed. The germination of these Guinea grasses is both exceptionally low and very variable, but an attempt to make seed commercially available is justified. Where the contours of the land are favourable, the small fields should eventually be included in a system of crop rotations in which resown pastures figure as the main crop. Such resown pastures should comprise several species including a legume, and for the latter purpose lucerne has shown promise under local conditions. The repetition of earlier failures with lucerne may be prevented to some extent by planting inoculated seed in land which has received lime and phosphate in additon to thorough cultivation and green manuring, and by applying superphosphate annually. Lucerne may be included in pastures, it may be grazed in a pure stand, or, when a surplus is available, it may be made into silage after treatment with molasses. It is desirable that greater attention be given the storage of surplus summer lucerne as molasses silage and less effort wasted in abortive attempts to cure hay in the summer.

A dry season can be expected to extend over several months during the latter part of the calendar year. During this dry season no pasture, whether grub-infested or otherwise, can be expected to provide satisfactory grazing. Therefore it is essential for profitable dairying that conserved fodder be available for use in the dry season. Silage is undoubtedly the form of conserved feed best suited to the requirements of the Atherton Tableland, and a roofed circular pit is a very satisfactory type of silo in this area. A combined maize and legume crop for silage can be produced on most, if not on all, farms in the area, provided superphosphate is added when sowing the crop. Experimental evidence clearly indicates that such combined crops, when grown with superphosphate, produce heavy yields of green materials and cure into superior silage. It is very desirable that every advantage be taken of the fact that severe outbreaks of white grubs can be predicted some eighteen months in advance, and, when a severe outbreak is expected, additional supplies of silage provided.

ACKNOWLEDGMENTS.

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APPENDIX I.

PEERAMON PASTURE EXPERIMENT.

Object.—To determine the utility of farm implements for renovating white grub infested paspalum pasture.

Land.—The experimental area is quite close to the township of Peeramon, at the base of a slope, and is fairly level. The land had never been ploughed.

Pasture.—Paspalum heavily infested by white grubs.

SUMMER, 1935-36.

Treatments—

A. Disc-ploughed before double harrowing.
B. Disc-ploughed before single harrowing.
C. Disc-ploughed only.
D. Untreated.
E. Mouldboard-ploughed before double harrowing.
F. Mouldboard-ploughed before single harrowing.
G. Mouldboard-ploughed only.

Procedure.—Each treatment strip comprised half an acre 5 chains long and 1 chain wide. The old timber was removed and treatments completed by the end of 1935. The whole area then was fenced off and stocking controlled in order to favour the recovery of the pasture.

Results.—Plough renovation in this field was disappointing, except on the strips renovated with mouldboards only. Very dry weather was experienced for eight weeks after the ploughing, and this probably killed a percentage of grass which would normally have recovered in favourable weather. Examination of the pasture early in 1936 indicated that ovipositing beetles had not entirely avoided ploughed land, as first-stage grubs were then present.

The following conclusions were drawn from the experiment:—

(*a*) Mouldboard-ploughing is a safer and more effective method of renovation than disc-ploughing.

(*b*) No harrowing is necessary to hasten pasture re-establishment.

(*c*) Cultural renovation should not be attempted before the beginning of the wet season.

APPENDIX II.

MALANDA PASTURE EXPERIMENT.

Object.—To ascertain whether lime and nitrogen, if applied to ploughed and unploughed white grub infested pastures, effect any improvement in carrying capacity.

Land.—The area used in this experiment adjoins the main road between Malanda and Atherton and is about 2 miles from Malanda. The soil is red, more or less typical of the area, and derived from basalt. At the beginning of the experiment the pH was about 5·5. The land is almost level, falling away slightly to the north-east.

Pasture.—The original pasture comprised paspalum and Rhodes grasses mixed with some white clover, and the sward was not in flourishing condition. The field was almost uniformly infested with white grubs, though the infestation was not severe.

SUMMER, 1935-36.

Treatments—

A. Quicklime, ½ ton per acre;

B. Quicklime, 1 ton per acre;

C. No fertilizer or quicklime;

D. Quicklime, ½ ton, with sulphate of ammonia, 3 cwt. per acre;

E. Quicklime, 1 ton, with sulphate of ammonia, 3 cwt. per acre;

F. Sulphate of ammonia, 3 cwt. per acre—

each of the above pasture treatments over each of the following:—

(*a*) Pasture unploughed;

(*b*) Pasture plough-renovated by discs;

(*c*) Pasture plough-renovated by mouldboards.

Procedure.—The field was first cleared of tree stumps, &c. One-half of the area was then ploughed, partly with mouldboards and partly with discs. Each treatment was applied to an area 5 chains by 1 chain, the lime being applied shortly before ploughing in late November, about two months before the onset of general rains. The sulphate of ammonia was applied in two equal dressings, in mid-January and at the end of April. The whole area was grazed after 1st March, the ploughed section and the unploughed section separately, as the former was expected to provide more feed than the latter.

Results.—It was soon apparent that recovery of the pasture on the ploughed section was superior to that on any part of the unploughed section. The growth of paspalum in the former was so vigorous early in 1936 that any effect of the lime and/or nitrogen was completely masked. Recovery was more rapid after mouldboards than after discs. White clover was almost absent from the ploughed section during the autum and winter of 1936, although it was fairly abundant in the unploughed section at the same time. Thus plough renovation may temporarily suppress any white clover which is present in the pasture before treatment.

There was never any indication that the application of lime had any effect on the pasture, but there was a definite response to nitrogen each time it was applied to unploughed pasture. A slight response to nitrogen, even in the ploughed section, was noticeable in May, 1936, after the second application of sulphate of ammonia.

More grazing was provided by the ploughed section than the other, the relative figures for ten months being 158 and 125 cow-days respectively. These figures may under-estimate the real difference, because the animals grazed less on the unploughed section and made up the deficiency when allowed access to the other. During the first year after treatment, the best strip on the unploughed section was quite inferior to anything in the ploughed area.

APPENDIX III.

MT. QUINCAN PASTURE EXPERIMENT.

Object.—To ascertain the comparative value of lime and different types of phosphatic and nitrogenous fertilizers for treating old pastures after plough renovation.

Land.—The land used was almost level country adjoining the road to Kureen, the red soil being typical of the locality.

Pasture.—Paspalum was the dominant grass, though some patches of kikuyu and carpet grass were also included. The pasture had been previously ploughed for renovation twice, the last time three years before the initiation of this experiment.

SUMMER, 1936-37.

Treatments.—Plough renovation followed by—

A. No fertilizer;

B. P_2O_5 22 lb. per acre as superphosphate;

C. P_2O_5 66 lb. per acre as superphosphate;

D. P_2O_5 76 lb. per acre, N 22 lb. per acre } as superphosphate and sulphate of ammonia;

E. P_2O_5 76 lb. per acre, N 22 lb. per acre } as bonedust and sulphate of ammonia;

F. P_2O_5 76 lb. per acre, N 22 lb. per acre } as meatworks manure—

the fertilizers being applied in two randomised blocks.

The following liming treatments were applied, each to a strip comprising one-third of the area:—

(*a*) No quicklime;
(*b*) Quicklime, 2 tons per acre;
(*c*) Quicklime, 4 tons per acre.

Procedure.—The whole area was renovated by ploughing early in January, 1936, and the lime applied to appropriate plots immediately. Two weeks later the fertilizers were applied. Korean clover was then broadcast at 1 lb. per acre over the whole area, and the seed harrowed in. At the beginning of April, white clover was broadcast at 3 lb. per acre, also on the whole area. The pasture was lightly stocked when recovery was sufficient to permit grazing.

Results.—Little or no response was obtained from any of the several treatments. No differences from plot to plot could be seen at any time throughout the year 1937-38 in spite of favourable growing weather. Korean clover and white clover failed to persist though they germinated satisfactorily.

APPENDIX IV.

BUTCHER'S CREEK PASTURE EXPERIMENT.

Object.—To ascertain whether the response of white grub infested pastures to plough renovation can be improved by resowing immediately after renovation.

Land.—The experimental area is on gently sloping country quite close to the Boonjie road, the soil being lighter in colour than that about Peeramon and further to the west.

Pasture.—Paspalum was still the dominant species, though it had been suppressed in a number of places by carpet grass. The pasture was grub-infested, carpet grass being particularly noticeable where heavy infestation had previously destroyed the paspalum.

SUMMER, 1936-37.

Treatments.—Plough renovation of the whole experimental area followed by a sowing of the following pasture plants, each of the grasses being sown with each of the legumes:—

A. No grass;

B. Paspalum, 5 lb. per acre;

C. Purple-topped Guinea, 5 lb. per acre;

D. Rhodes, 10 lb. per acre;

E. Wholly finger grasses by root sets—6 feet by 4 feet apart;

F. Winter grass mixture—

Wimmera rye, 5 lb. per acre;
Italian rye, 5 lb. per acre;
Prairie, 12 lb. per acre.

(*a*) No legume;
(*b*) Lucerne, 2 lb. per acre;
(*c*) White clover, 2 lb. per acre;
(*d*) Red clover, 2 lb. per acre;
(*e*) Annual Korean clover, 2 lb. per acre;
(*f*) Perennial Korean clover, 2 lb. per acre.

There were three replications of each of the thirty-six treatments, and superphosphate at 1 cwt. per acre was applied to two of the three.

Procedure.—The land was cleared of tree stumps, &c., disc-ploughed, harrowed, and fenced off in January, 1937. The surface after ploughing was so rough that several harrowings were necessary to leave the surface reasonably level.

All grasses, except the winter mixture, were planted in half-chain strips in February, 1937, each treatment recurring once in each of three blocks. The five legumes were sown in long strips across these three blocks in April, 1937, the winter grasses being sown at the same time. After sowing the legumes, two of the blocks were treated with superphosphate at 1 cwt. per acre.

Both the Korean clovers were resown at the end of 1937.

Results.—Stocking was carefully controlled, the experimental area being grazed as one field at suitable intervals from June, 1937, onwards.

There was no evidence that any of the winter grasses was established. Some of the woolly finger rootlets struck, but failed to persist. The paspalum benefited from the plough renovation, but it is doubtful whether reseeding with this grass was an additional advantage. Both Rhodes grass and purple-topped Guinea grass have grown very well. These species have increased the volume of pasture available, but whereas Rhodes does not appear to be relished by stock once it has reached the stage of seeding, the purple-topped Guinea is apparently so palatable that it is eaten off short soon after stock are allowed access to it. The observational evidence indicates that reseeding with either Rhodes or purple-topped Guinea would be a profitable adjunct to plough renovation. Both species tend to check the development of weeds, which are generally troublesome during the first year after renovation.

APPENDIX V.

KUREEN PASTURE EXPERIMENT.

Object.—To obtain information of the habits of some grasses and legumes when grown together as two species grass-legume mixtures.

Land.—Old pasture land which had been cleared and plough-renovated ineffectively some years previously.

SUMMER, 1937-38.

Treatments.—Duplicate plots of the following:—Lucerne, sweet clover, and annual Korean clover at the rate of 3 lb. per acre, each in combination with each of the following grasses:—

A. Paspalum, 10 lb. per acre;

B. Rhodes grass, 5 lb. per acre;

C. No grass;

D. Woolly finger root sets—2 feet by 2 feet apart;

E. Purple-top Guinea root sets—2 feet by 2 feet apart;

F. Slender Guinea root sets—2 feet by 2 feet apart.

Procedure.—Thorough cultivation followed by an application of quicklime at 2 tons per acre and fertilizer (N 17 lb., P_2O_5 60 lb., K_2O 28 lb.) as meatworks and sulphate of potash. All the plots were planted early in January, 1938.

Results.—All of the grasses, except woolly finger, were strongly established in a few months. The legumes, on the other hand, made little progress until the following summer. Lucerne appeared to be the most promising legume for combination with any of the grasses, but further results can be expected.

APPENDIX VI.

PEERAMON ROTATIONAL CROPPING EXPERIMENT.

Object.—To establish a method of rotational cropping extending over several years, and culminating in a grass-legume pasture which would be regarded as the main crop.

Land.—The area available for this experiment was on the common morocco-red basaltic clay. It is on gently-sloping country, about ½ mile from a granitic outlier. The field had been in cultivation for a number of years before being devoted to experimental work, though there had been an appreciable but gradual decline in productivity. Experimental treatment of the field has now extended over a number of years.

SUMMER, 1935-36.

Treatments.—

A. Maize and rice bean sown in the same drill;

B. Sorghum and rice bean sown in the same drill.

Procedure.—These crops were grown for silage. The maize and bean were in drills 3 feet 8 inches apart in the eastern half of the field. The red Kaffir sorghum and bean were sown in drills 3 feet apart in the western half of the field. All crops were sown in mid-January, 1936.

Results.—Yields were extremely low, large areas producing little or no crop at all. The sorghum was more subject to failure in bad patches than the maize. The rice bean failed to germinate, faulty seed being responsible. The total yield of green silage material from the whole field was under 3 tons per acre. The estimated growth values of the sorghum in regularly-spaced quadrats were recorded in the western half of the field. Growth values range from 0 (complete failure) to 10 (satisfactory growth).

SUMMER, 1936-37.

Treatments.—

A. Poona pea only;

B. Sorghum and Poona pea;

C. Maize and rice bean.

The following treatments were applied in four blocks, traversing the three-crop treatments:—

A. P_2O_5 75 lb. per acre as superphosphate;

B. Quicklime, 2 tons per acre;
N 25 lb. per acre as dried blood;
P_2O_5 75 lb. per acre as superphosphate;
K_2O 30 lb. per acre as sulphate of potash;

C. Quicklime, 2 tons per acre;
P_2O_5 54 lb. per acre as meatworks manure;
N 16 lb. per acre as meatworks manure;

D. No fertilizer or quicklime.

Procedure.—The lime and fertilizers were applied in December and January after the field had been well prepared. The crops were sown in mid-January—maize at 12 lb. per acre, and rice bean at 4 lb. per acre, sorghum and Poona pea both at 8 lb. per acre, and Poona pea alone at 12 lb. per acre. The Poona pea seed was inoculated before sowing.

Results.—Both the Poona pea alone and Poona pea with sorghum were ready for cutting eleven weeks after sowing; these crops could not be used for silage then, as the maize with rice bean was not nearly mature. The estimated yield of sorghum and Poona pea on the best part of the lime and complete fertilizer block was nearly 12 tons of green material per acre, containing 28 per cent. Poona pea. Both these crops, on the western half of the field, were ploughed-in for green manure between eleven and twelve weeks after sowing.

The maize and rice bean were ready for cutting sixteen weeks after sowing, and harvesting commenced then. The maize was still green, though the grain was fully formed and beginning to harden, and the rice bean bore a heavy crop of pods which were still green. Four drills of the crop were cut and the two components harvested separately. The yields from the variously fertilized blocks are recorded in Table III.

Winter, 1937.

Treatments.—The whole 6 acres in the field—three from which silage was harvested, and three which had been green-manured with Poona pea and sorghum—were all planted with a mixture of wheat and field peas.

Procedure.—The field was ploughed immediately the silage harvest was complete. The wheat and peas were planted at the end of May. This crop suffered droughty conditions throughout its growth and was grazed off by dairy cows during September.

Results.—The residual effect of fertilizers was noticeable, growth on the old lime plus complete fertilizer block being most superior. Growth over the whole 3 acres which had received green manure was at least twice as great as the growth on that part of the field from which silage had been harvested.

Summer, 1937-38.

Treatments.—A green manure crop comprising red Kaffir sorghum and Groit cowpea at 6 and 15 lb. per acre respectively was planted over the whole field after liming the previously unlimed strips. Superphosphate at 1 cwt per acre was applied over the whole field.

Procedure.—After thorough cultivation and manuring, crops were planted in mid-December, the seeds being mixed and sown through a wheat drill—i.e., in drills 7 inches apart.

Results.—The combined crop made excellent growth, but the residual effect of fertilizer from the previous summer was still discernible. Random sample weighings were made just before the crop was ploughed-in ten weeks after sowing. Each sample was cut from 17·11 square yards (a strip the width of the drill and half a chain in length), and three samples were taken from each of the previous summer's fertilizer blocks. The cut weights are recorded in Table XI.

TABLE XI.

SILAGE CROP YIELDS IN FERTILIZER EXPERIMENT, 1937-1938.

Block.	Cut.	Green Weights—Lb. per Plot.			Tons per Acre.
		Sorghum.	Cowpea.	Total.	
(a) ..	1 ..	23	40·5	63·5	8·02 } Average 12·1
	2 ..	57	64	121	15·28
	3 ..	47	56	103	13·00
(b) ..	1 ..	57	48	105	13·26 } Average 17·03
	2 ..	85	52·5	137·5	17·36
	3 ..	77	85	162	20·46
(c) ..	1 ..	..	..	110	13·89 } Average 13·77
	2 ..	..	..	106	13·39
	3 ..	52	59	111	14·02
(d) ..	1 ..	23·5	67	90·5	11·42 } Average 9·38
	2 ..	35	48·5	83·5	10·54
	3 ..	26	23	49	6·19

This green manure crop was excellent, and, although the ploughing-in occurred when both the sorghum and the cowpea were just beginning to flower, a good bulk of green material was turned into the soil.

WINTER, 1938.

Treatments.—Establishment of a balanced pasture comprising lucerne, Rhodes grass, and prairie grass.

Procedure.—A month after ploughing-in the green crop, the field was cultivated with a heavy tandem disc implement. A fortnight later—early in April—inoculated lucerne was sown through a seeds drill at 3 lb. per acre after broadcasting Rhodes at 5 lb. per acre and prairie at 10 lb. per acre. Drilling-in the lucerne served to cover the grass seed, and no further cultivation was given, except that the field was rolled on the following day.

Results.—Some weeks of dry weather occurred after planting, but a good storm at the beginning of July enabled the pasture to become established by the middle of August. The feed was grazed off at this time.

Recovery of the lucerne and Rhodes was excellent after the early storms at the end of 1938 and a good pasture is now established. Observations on its productivity under normal management will continue.

APPENDIX VII.

MALANDA ROTATIONAL CROPPING EXPERIMENT.

Object.—To establish a balanced pasture on land which has deteriorated in fertility after being in cultivation for a number of years.

Land.—The field used for this experiment is composed of red soil on gently sloping country.

Procedure.—After thorough cultivation in 1937, a green manure crop of Poona pea, 20 lb., and red Kaffir sorghum, 6 lb. per acre, was planted without fertilizer in mid-December. This crop made excellent growth, the weight of green material reaching a mean of 14 tons per acre when it was ploughed under, nine and a-half weeks after sowing. The legume comprised about half of the crop.

A seeds mixture comprising Florence wheat at 30 lb. and lucerne (inoculated seed) at 3 lb. per acre was sown in April, 1938, two months after ploughing-in the green manure. At the end of the following December paspalum and Rhodes grass at 10 lb. and 6 lb. per acre respectively were sown.

Results.—The lucerne-wheat mixture grew well and provided good grazing for the dairy herd during the winter, being grazed off three times. At the end of August, after mowing to destroy weeds and the remains of the wheat, the lucerne appeared to be established. This component made a very good recovery during the storms of early summer, and the grasses, sown after mowing, appeared to be established. It thus appears that a satisfactory pasture may be built up by the methods outlined. Observations on its productivity under normal management will continue.

APPENDIX VIII.

PEERAMON LUCERNE EXPERIMENT.

Object.—To determine some of the difficulties associated with lucerne-growing in the white grub area.

Land.—This experimental field is 4 acres in extent, situated in a corner between the creek and the western boundary fence. About 2 acres on the bank of the creek are level, but beyond this there is a gradual rise to the south-west corner. The soil appears to be typical of the locality, but no analyses are available.

Pasture.—Before initiating the experiment the land carried an old slightly grub-infested paspalum pasture.

Summer, 1935-36.

Procedure.—The land was ploughed twice towards the end of 1935, and harrowed again early in January. Maize was planted in drills in mid-January.

Results.—Maize harvested for silage four months after planting yielded approximately 12½ tons per acre. This cropping treatment effectively cleared the land of weeds, and also helped to smother the surviving paspalum.

Winter, 1936.

Treatments.—Lucerne was planted over the whole área and then the following fertilizers were applied in blocks:—

A. No fertilizer or lime;
B. P_2O_5 at 33 lb. per acre as superphosphate;
C. Ground limestone at 1 ton per acre;
D. Ground limestone at 1 ton per acre;
P_2O_5 at 33 lb. per acre as superphosphate.

Procedure.—Immediately the maize was harvested the lime was spread, the land ploughed and thoroughly cultivated. Inoculated lucerne seed was sown at 10 lb. per acre early in June. Superphosphate was not applied until the end of the year, when summer storms are normally expected.

Results.—Establishment of the lucerne was patchy at first, but the crop survived the dry season comparatively well.

Summer, 1936-37, and After.

Procedure.—The crop was mown early in January, yielding more than ½ ton of hay per acre. The next growth was grazed off by dairy cows in February. In March the lucerne was attacked by Pseudopeziza leaf spot. The available feed was grazed off, and the remainder then mown and removed from the field.

During the winter the field was divided into three approximately equal areas by light two-wire fencing, and since then the lucerne has not been mown. Whenever the crop has made sufficient growth for the purpose, the herd of dairy cows has been utilized to graze down each of the small areas in turn.

Results.—Two and a-half years after planting, this lucerne still provided very profitable grazing, and it seems that the use of inoculated seed and annual applications of phosphate will do a great deal to overcome the difficulties associated with the crop in the white grub infested area. There is no evidence that the use of lime in this field was of any material value.

APPENDIX IX.

PEERAMON SILAGE CROP EXPERIMENTS.

Object.—To ascertain whether the percentage of legume in a maize-rice bean silage crop mixture can be increased by variations in the rate of planting both components.

Land.—The land was old cultivation on typical red soil.

SUMMER, 1937-38.

Treatments.—The land was limed and fertilized and the following combinations of crops planted in duplicate:—

A. Rows, 4 feet; maize single grains, 9 inches; rice bean, 6 lb. per acre.

B. Rows 4 feet; maize single grains, 9 inches; rice bean, 8 lb. per acre.

C. Rows, 3 feet; maize single grains, 9 inches; rice bean, 10 lb. per acre.

D. Rows, 3 feet; maize single grains, 12 inches; rice bean, 10 lb. per acre.

E. Rows, 3 feet 6 inches; maize three grains, 18 inches; rice bean, 10 lb. per acre.

F. Rows, 4 feet 6 inches; maize single grains, 6 inches; rice bean, 10 lb. per acre.

Procedure.—Ground limestone at 3 tons per acre was applied to the field in October. The land was drilled out towards the end of November and the following fertilizer applied to the drills:—Meatworks at 3 cwt. per acre, and sulphate of potash at 56 lb. per acre. The seeds were sown in these drills at the end of November.

Results.—The yields from the various plots (Table IV.) show that, under the climatic conditions experienced and when rice bean was grown with a maize maturing for silage in fifteen weeks, the percentage of rice bean in the combined crop was not materially increased by any of the rates of planting adopted. The legume had not commenced flowering when the crop was harvested, even though the maize was quite ready for the silo.

APPENDIX X.

PEERAMON SILAGE CROP EXPERIMENT.

Object.—To ascertain the value of various legumes for growing with maize to produce a protein-rich ensilage.

Land.—This trial was immediately adjacent to the one described in Appendix IX. above.

SUMMER, 1937-38.

Treatments.—The land was limed and fertilized and the following combinations of crops planted in duplicate:—

A. Maize single grains at 9 inches apart; Rice bean at 10 lb. per acre.

B. Maize single grains at 9 inches apart; Giant cowpea at 10 lb. per acre.

C. Maize single grains at 9 inches apart; Groit cowpea at 10 lb. per acre.

D. Maize single grains at 9 inches apart; Ototan soy bean at 10 lb. per acre.

All combinations planted in rows 3½ feet apart.

Procedure.—Lime and fertilizer was applied exactly as in Appendix IX. above. All of the crops were sown in the drills at the beginning of December.

Results.—The yields of the various combined crops are recorded in Table V. Both Groit cowpea and Ototan soy bean show promise for combination with maize for silage.

Cf. xxii, 711.

Red Scale on Citrus Trees.*

J. HAROLD SMITH, M.Sc., Senior Research Officer.

THE red scale† is one of the best-known pests of citrus in Queensland, although it is usually more troublesome in subcoastal orchards than in coastal areas, where other species are equally, if not more, destructive. Almost all varieties of citrus may be attacked, but the problem facing the grower is frequently complicated by local conditions of some importance. In coastal areas south of Gympie, the red scale is a secondary pest. Lemons are certainly infested, but the acreage under this crop is relatively small. Young trees of other varieties may also suffer, but tend to throw off the attacks before they have been bearing for many years. Further north, at Howard, red scale is more common and is of particular interest in the Emperor of Canton mandarin, a loose-skinned early variety commonly grown in the district. On the Emperor mandarin, scale insects on the fruit in February and March tend to be enmeshed by the rapidly growing rind and remain on the fruit even after being killed by the application of effective control measures. In Gayndah and other subcoastal citrus districts, lemons are an important crop, which, together with grape fruits, Valencia oranges, and Beauty of Glen Retreat mandarins, constitute the more important red scale susceptible hosts.

LIFE HISTORY AND HABITS.

Red scale (Plate 232) occurs on the trunk, foliage, and fruits of citrus trees, frequently in such numbers that masses of encrusted scales can be peeled away intact. In midsummer all stages are represented from the minute "crawler" to the adult female, which is approximately one-twelfth of an inch in diameter. The adult female is flattened, yellowish in colour, and more or less pear-shaped, but is not normally seen as such, for it secretes a characteristic greyish-red or pink-tinged parchment-like scale, under which it shelters. The secretion of this scale begins as soon as the crawler settles down in a permanent position, and the type of scale depends on the sex of the individual. In the female the scale is round, with a slightly raised centre, and growth takes place evenly in all directions. Development continues until maturity, and, indeed, until death. The male has a somewhat similar scale, but the core is off-centre and the outline is oval rather than circular. Unlike the female, the male spends only part of its life under the scale, from which it finally emerges as a delicate winged adult capable of a very weak flight.

The female reproduces for most of its adult life. The eggs hatch within the body of the insect, the minute "crawlers" escaping from the scale and wandering about for some time. They tend to move to the more exposed parts of the tree, a habit which explains the normally heavy infestation on the fruit. Distribution from tree to tree and from orchard to orchard by wind and birds may occur at this stage. Very shortly they settle down in permanent positions and commence to secrete the covering scale, the size of which increases with the growth of the underlying insect. The limbs are lost at the first moult.

* Entomological Leaflet No. 29 was originally issued in 1935. The present text has been entirely rewritten to meet advisory requirements.

† *Aonidiella aurantii* Mask. xxiii, 761.

Plate 232.
RED SCALE.—Showing infestation of fruit, foliage, and woody twigs.

Meanwhile feeding takes place, sap being abstracted from wood, fruit, or leaves by the elaborately constructed mouthparts.

The rate of development from birth to maturity varies with the season, being more rapid in summer than in winter, when the bulk of the scale population, in fact, dies. Five or six generations may be completed in a single year, and, as each female normally produces about eighty young in Queensland, the health of the trees can be seriously affected if control measures are not applied. Dieback of the younger twigs follows, tree vigour is impaired, and the scale population on the fruit necessitates cleaning before marketing—an expensive and time-consuming task, which in some varieties may be both incompletely effective and harmful to the fruit.

The red scale population varies from season to season and from tree to tree. In the former case, climatic conditions are responsible, for in the wet coastal areas, where the pest is normally of no great importance, a dry season or a succession of dry seasons is accompanied by an abnormal increase in the red scale population. The same phenomenon has been frequently recorded in subcoastal irrigated orchards, but there the effects on the trees can to some extent be countered by judicious watering. Variations in red scale incidence from tree to tree may be due to a number of factors, but there can be little doubt that the habit of growth and general health of the host have some bearing on the amount of infestation. Unthrifty trees, particularly in the coastal belt, are more subject to attack than normally vigorous trees.

CONTROL.

Precautionary Measures.

Freedom from infestation for many years can frequently be maintained in a newly established orchard if adequate precautions are taken to ensure that all nursery stock introduced into the area is clean. Young trees purchased from outside sources should be carefully examined when delivery is taken. Badly Bady-infested plants should then be destroyed, but those carrying only a nominal amount of scale may be planted after first being fumigated. In addition, young trees should be periodically examined in the orchard so that any small development of the pest can be checked at an early stage.

Parasites.

Several parasites have been recorded from the red scale, and, in some years, they may destroy the bulk of the pest population. Their attacks are very variable, however, and the grower can seldom rely on them to solve his red scale problem. They are invariably most active when the red scale population is much higher than should normally be the case in a well-managed orchard, and are best regarded as a useful, though fickle, adjunct to the grower's campaign against red scale.

Choice of Control Methods.

In practice, red scale is kept in check by fumigation, fumigation supplemented by spraying, or spraying alone, the choice of method depending partly on local conditions and partly on the facilities at the grower's disposal. Fumigation is unquestionably most effective, but

suitable sprays, thoroughly applied and correctly timed, do extremely good work. The red scale control programme adopted by the grower will be determined by—

(*a*) The equipment and labour available—When fungicides must be applied to the trees, an efficient power spray is a necessity in the orchard. Many growers naturally hesitate to incur the expense of fumigation sheets if the pest and disease problem can be reasonably handled without them. In some districts this is quite practicable; in others, both sets of equipment are indispensable in properly managed orchards, and the grower must regard the power spray as a first essential, to be supplemented by fumigation facilities as soon as may be practicable.

(*b*) Location.—In coastal areas, particularly where the rainfall is heavy, fumigation is seldom practicable and requires special precautions and considerable experience which are rarely at the grower's disposal. The spray technique is thus the only one available.

(*c*) Pests and disease associations.—Though most scale insects can be controlled by a spraying programme, some other citrus pests—e.g., the larger horned citrus bug—are better dealt with by fumigation, which is also effective against the red scale. If these are the only important pests and citrus diseases are of no consequence, fumigation facilities alone may meet the requirements of the orchard.

Fumigation.

Only one fumigant—hydrocyanic acid gas—is used at all extensively in Australia for the control of the red scale and other citrus pests. In Queensland, daylight fumigation is practised chiefly in the Gayndah district, but also in other subcoastal areas, and to a lesser extent in drier coastal regions such as Howard.

Hydrocyanic acid gas can be prepared in a variety of ways. The old pot method in which the gas was evolved by the interaction of potassium cyanide with sulphuric acid and water has been superseded in the orchard by the use of calcium cyanide, which gives off the gas very quickly on exposure to moist air. Calcium cyanide is available in dust and briquette forms, the latter having to be crushed on the orchard in a special machine. The calcium cyanide thus reaches the tree as a dust, distribution being accomplished preferably by mechanical blowers, though some growers, not possessing the necessary apparatus, introduce the dust into the tents by hand-casting from a suitable flat dish or plate. In practice, octagonal sheets of light-weight tightly woven durable calico are used, the size depending on the average tree dimensions and varying from 30 feet to 80 feet in diameter. The most popular size is 40 feet in diameter, which should cover a well-shaped 13-feet-high tree. In any case, sheets should be made larger than is strictly necessary, to allow for tree growth from year to year and to ensure adequate ground overlap.

Calcium cyanide reacts with moisture in the air and liberates hydrocyanic acid gas. Normally, even in dry weather, there is ample moisture to release all the available gas, but in practice fumigation should not be attempted in extremes of heat or humidity, for either may induce severe burning. A slight amount of tip-burning is of little consequence, and some growers try to adjust dosages to produce such symptoms of burn. Fumigation charts issued by distributors of calcium cyanide dusts and

calcium cyanide briquettes give dosage schedules for a wide range of temperatures and humidities. Tent measurements, temperatures, and humidities must be correctly recorded in determining dosages when the sheets are placed in position; otherwise gas concentrations greater than those permissible in the orchard may cause injury to the trees.

Certain precautions are essential in fumigation, the neglect of which can cause injury even when volumes and dosages are accurately calculated. The chief are—

(*a*) A reasonable time should elapse between the application of a copper fungicide and fumigation. The period varies with humidity and rainfall, and is longer following Bordeaux than colloidal copper—the two fungicides principally used. As a precautionary measure, single trees of each citrus variety carrying a copper fungicide should be fumigated to determine the safety or otherwise of fumigation before the whole orchard is treated.

(*b*) Susceptibility to injury is particularly noticeable when soil conditions are very wet or very dry, when the fruit is very small—less than ¾ inch in diameter—and when young growth is abundant. Common-sense care alone is necessary, treatment being applied only when cultural conditions are normal.

(*c*) Fumigation should not be attempted when trees are carrying free moisture in the form of rain—e.g., after a shower—or as dew. Ill-effects may also follow the use of damp sheets.

(*d*) High temperatures increase the risk of injury. Dosage charts adopt some conventional method of indicating the probable safe limits for treatment.

(*e*) Fumigation should not follow oil sprays until at least a fortnight has elapsed; otherwise injury may occur. Red scale control is unlikely to raise this problem, for both treatments are fatal to the insect, and would not normally be used in such rapid succession.

Spraying.

Three sprays* can be used for the control of red scale in Queensland.

The first, white oil, is purchasable as an emulsion which merely requires dilution with water before use. Various proprietary brands of white oil are on the market.

The second, resin-caustic soda-fish oil, is an excellent general-purpose scalicide, which is particularly useful in districts where red scale is only one of a number of insect pests. The spray concentrate containing 10 lb. of finely ground resin, 3 lb. caustic soda, 1½ lb. fish oil in 2 gallons of water can be prepared on the orchard and diluted before use with 38 gallons to make 40 gallons of spray. A soft soap compounded to the above formula is on the market and merely requires dissolving in a specified amount of water to give the identical spray.

* For further information on insecticides (including fumigants), see Pamphlet No. 48 issued by this Department.

(In the original of XXII, 711 — p. 59)

In some districts a general-purpose scalicide other than resin-caustic soda-fish oil is preferred when red scale is one of several species infesting citrus trees. Soap-soda-oil is the spray concerned. The spray is prepared by dissolving 3 lb. of a shredded high-grade laundry soap in a minimum of water to which 8 lb. of washing soda have been added. The concentrate, together with 1½ gallons of white oil, is added to 75 gallons of water in the spray vat with the agitator working and applied immediately.

Timing Control Operations.

Owing to the rapid rate at which the red scale increases in numbers, an excellent kill at any particular time does not necessarily keep the population low during the following twelve months; the progeny of even a few survivors may be sufficient to build up appreciable populations in a comparatively short period. The timing of control measures may therefore be considered from two angles:—

(*a*) The health of the tree.—Any control measure which keeps the tree free from injurious populations for a relatively long period makes a far greater contribution to the health of the tree than one which, while giving temporary relief, permits early repopulation. From this point of view, February, March, and April treatments are the most valuable; the kill is excellent, subsequent rains and cool weather slow down development, and, as a result, appreciable scale populations do not normally appear until late summer of the following year.

(*b*) Freedom of fruit from infestation.—Only rarely do trees handled by a good orchardist carry sufficient red scale to affect the health of the tree, and his problem is primarily that of keeping the fruit clean. On some late varieties of citrus, e.g., Valencias, autumn treatments allow sufficient time for dead scales to drop before the fruit is harvested. On earlier types, e.g., grapefruit, dead scales may still adhere to the fruit when harvested, but cleaning is relatively simple. In Emperor of Canton mandarins the position is complicated, for the rind tends to grow over the scales which, whether dead or alive, are embedded in the rind and it is difficult, if not impossible, to remove them completely.

If seasonal conditions permit, control operations should be carried out from mid- to late- February, particularly in early-maturing varieties, in order to ensure the harvesting of clean fruit. In some years, when autumn is dry and warm, a build-up of the pest may take place before July, but any necessary check can be applied in midwinter by fumigation or a resin-caustic soda-fish oil spray.

Not infrequently, however, monsoonal rains clash with the optimum time for treatment, and control measures have to be deferred from four to six weeks. This is of little consequence in late-maturing varieties, but any such delay tends to make the removal of scale insects from early fruits more difficult.

The red scale population should never be allowed to get out of hand. The above programme will normally be adequate, but, like all programmes of this kind, the best results can only be obtained if the trees are healthy and thus capable of naturally resisting infestation.

The Brown Dog Tick (Rhipicephalus sanguineus).

F. H. S. ROBERTS, D.Sc., Animal Health Station, Yeerongpilly.

Description.

THIS is the common tick infesting dogs in Queensland. It is found practically everywhere within the State, even in the hottest and driest areas. The female tick (Plate 233; fig. B), when fully engorged with blood, is about one-third to one-half an inch in length and bluish-grey in colour. The male (Plate 233; fig. A) is smaller than the female and uniformly brownish in colour. The male is an intermittent feeder, never attaching to the one place for very long, and is usually seen moving actively among the hairs of the coat. The female, on the other hand, remains attached to the one spot until she is fully engorged.

When feeding, the tick inserts a club-shaped structure into the skin. This structure is armed with rows of recurved hooks. Any attempt to remove a tick by force invariably results in leaving this holdfast organ, or "head," as the layman calls it, behind in the skin.

Many people confuse the brown dog tick with the common cattle tick. A true cattle tick has pale flesh-coloured legs, whilst in the dog tick the legs are dark-brown.

A.—Male. B.—Female.

Plate 233.

THE DOG TICK (*Rhipicephalus sanguineus* Latr.) (A) AND (B).

Life History.

The female tick, when fully engorged with blood, drops from the dog and crawls to some sheltered spot. Here, after laying 1,000 to 3,000 eggs, the female dies. The eggs hatch in from nineteen to sixty days, according to the season of the year, and give rise to tiny larval ticks, little larger than a pin's head in size. These attach themselves to a dog at the first opportunity and are fully fed in from three to seven days. Dropping off the dog, they seek a hiding-place, where, in from six to twenty-three days, they cast their skins and become nymphs. In a few more days the nymphs are ready to feed and attach themselves to the first dog they come into contact with. In four to nine days the nymphs are engorged, drop off, and in another twelve to twenty-nine days cast their skins to form adult males and females. These young males and females quickly attach themselves to a dog, and in six to thirty days the females are fully engorged, when they then drop off and lay their eggs.

Economic Importance.

Under the very favourable conditions of our climate, the brown dog tick is capable of breeding very rapidly. Heavy infestations are common, and the loss of blood associated with the worry and irritation causes a great drain on the vitality of dogs. In other countries this tick is a vector of a serious fever in dogs, but, fortunately, this disease is not present in Australia.

Occasionally the tick may be carried into dwellings by dogs, and, whilst seldom attacking the human occupants, it can, at times, become so numerous as to be considered an important household pest.

Control.

The brown dog tick is a purely domestic pest in that it is found only in association with dogs. Its control is by no means simple, for attention has to be given not only to the treatment of infested animals, but also to the animals' sleeping places, where larvæ, nymphs, and young adults abound. The fact that these stages are able to survive for long periods without feeding—young adults, for example, over seven months—adds further difficulties to its control. This, then, becomes largely a matter of patient effort, but if the following recommendations are rigidly carried out control may eventually be accomplished:—

(1) Whilst arsenical and phenolic dips may kill any ticks on the dog, they do not prevent the larvæ, nymphs, and young adults lying waiting in the animal's sleeping quarters and other places from attaching themselves successfully shortly afterwards. The only insecticide of any value in preventing immediate reinfestation is derris. Derris may be used as a powder and is shaken well into the coat and on to the skin. It may also be applied in the form of a wash. The wash is made by soaking 2 oz. of derris powder in 1 gallon of water overnight. Next morning, just before it is used, sufficient soap is added to promote a good lather. The wash is allowed to dry on the coat. Derris should be kept away from the animal's eyes, as it may cause them to become inflamed. It should be used very cautiously with young puppies, especially of delicate breeds.

Treatment with derris should be given every six or seven days until the animal remains free from ticks. When using this treatment, examine the ears, eyelids, and in between the toes, and remove by hand any ticks seen.

(2) Burn or boil all old bedding and inspect and cleanse the bedding weekly. Clean up all litter around the animal's sleeping quarters and burn.

Spray the kennel with creosote oil or crude oil, forcing the spray into all cracks and crevices. Creosote oil is caustic if it comes into contact with animals.

Treatment is simplified if the animal's sleeping quarters are confined to the one place.

(3) Infested dwellings, especially if the ticks are very numerous, are best treated by fumigation. Crude oil or creosote oil may be used as sprays in outhouses, but are not suitable for use among furniture, &c. Although the ticks are fairly resistant to ordinary fly sprays, they can be killed if they are thoroughly wetted.

Dogs should be kept out unless they are to be used as traps for the free ticks, in which case the above recommendations for the treatment of the dogs must be strictly adhered to.

The Window Bud.

S. E. STEPHENS, Northern Instructor in Fruit Culture.

THE budding method described below has been evolved by the author of this article, particularly for the propagation of mangoes, but it has been tested on various other fruits such as citrus, litchis, and cashews, and found to be equally successful. The method is especially useful in the working of stocks of 1 inch to 3 inches in diameter, and so may be used in place of grafting, which is usually done on stocks of this size. The great advantages of the method are the elimination of large and exposed wounds and the holding of the bud in close contact with the stock. The latter consideration is of particular importance in the case of mangoes, which show a pronounced tendency towards the formation of thick corky layers of tissue under the buds with the ordinary T or inverted T methods of budding, thus causing an unsightly and frequently weak union.

Briefly, the method consists in the placing of an ordinary shield bud under a flap of bark turned back from the stock and the cutting of a "window" in the flap before replacing it, through which the bud is exposed to view.

The Operation in Detail.

A budding knife with a sharp pointed blade, such as that illustrated in fig. 1, is required. Two methods have been used in cutting the flap. It may be done in three cuts, one (A in fig. 2) horizontal across the stock, and two vertical (BB), $\frac{1}{2}$ inch to 1 inch apart, extending from the horizontal cut towards the base of the stock for a distance of about 2 inches. Or it may be done with the point of the budding knife in two cuts, starting at XX in fig. 3, drawing the knife upwards on converging lines to a common point Y. The flap of bark should then be loosened with the point of the knife at the corners AB or Y, as the case may be, and gently pulled away from contact with the wood. This is an important point, as the action of tearing the bark away exposes exactly the cambium layer. Further, it gives an indication as to whether the stock is in a fit state to work, as the bark will only peel cleanly and easily when the stock is in an active condition.

A window is then cut out of the centre of the flap. It should be not more than one-quarter of an inch wide by five-sixteenths of an inch long. It is cut most easily with the point of the knife from the inside of the flap, which is bent over for the purpose, the tension on the bark assisting in easing the cutting (figs. 4 and 5).

An ordinary shield bud is then cut from the scion material, the petiole or leaf stalk, if present, being cut back to a stub of about one-tenth of an inch. The bud should be cut rather large, about an inch and a-half to two inches long. It is inserted without undue delay under the bark flap, and placed in such a position that the bud is visible through the window (fig. 6).

The flap should then be bound back in position with raffia and the whole sealed with grafting tape, the bud being completely covered. After a period of eight to ten days for citrus, up to three or four weeks for mangoes, the tape is removed and the raffia cut. If the operation

Fig. 1.

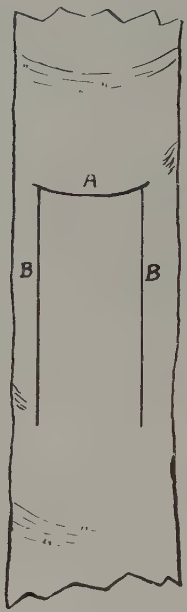

Fig. 2.

Fig. 3.

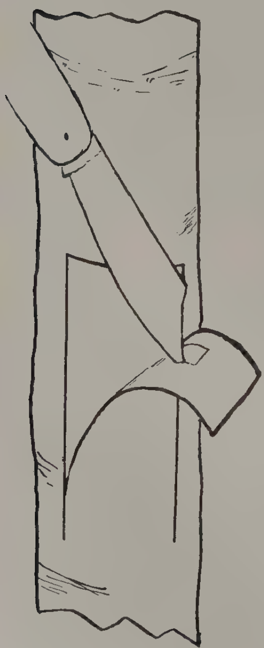

Fig. 4.

Fig. 5.

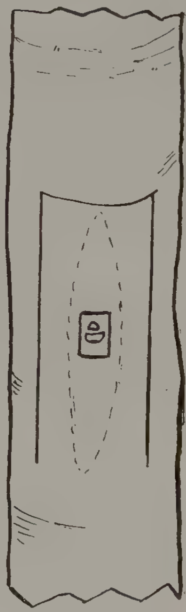

Fig. 6.

Plate 234.

Plate 235.
THE WINDOW BUD.—Placing the bud.

has been well performed, the whole flap will have re-united with the stock, and the only evidence of its removal will be the window and a narrow line of new tissue along the cuts. The stock may then be ring-barked above the bud, or cut and bent over, to start the bud into growth. After growth has commenced, the stock may be headed back in the usual way.

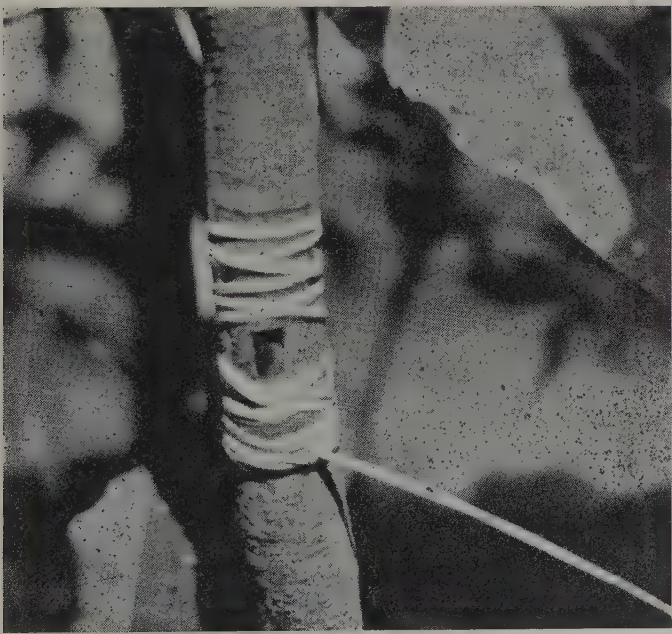

Plate 236.
THE FLAP TIED IN POSITION AFTER INSERTING THE BUD.

In this, as in all other budding methods, success lies in cleanliness and neatness in making the several cuts, and in working the stock when it is in active or flush condition, with bud-wood dormant. Cleanliness of tools is assured by the frequent wiping of the blades with a soft cotton cloth saturated with alcohol or methylated spirits. Neatness also

Plate 237.

A SUCCESSFUL BUD ON LEMON STOCK.—Note the neatness of the union.

is assured by maintaining a razor edge on the budding knife. A blade which will not shave is too blunt for budding. A good quality smooth butcher's steel used after every five or six cuts will keep the blade at the required keenness. Active, flush condition of stock may be assured by applying a liquid manure dressing of 1 oz. of sulphate of ammonia in 1 gallon of water several days before commencing the budding.

MARKING FRUIT TREES.

Because it is found impracticable to apply corrective methods immediately to drone fruit trees, or to trees known to require some specialised treatment for disease at some more opportune time, it is wise not to leave future identification of the tree to guesswork. The simplest way of marking such trees is by tying a narrow strip of cloth—preferably white—to a conspicuous limb.

In the case of individual trees giving light annual crops, pruning may be at fault. It is possible, too, that an individual tree may be a host of some serious pest that has not yet established itself throughout the orchard. The white rag indicator will serve as a reminder at a time later on when the necessary control can be conveniently applied. By marking the tree, the observant orchardist also will be able to note from time to time the efficiency of the control applied.

Unsuitable varieties and poor fruit types observed during harvesting and marked are not likely to be overlooked when reworking is being done in the proper season if they can be easily identified.

Hand versus Machine Milking.

A COMPARISON OF THE HYGIENIC QUALITY OF THE MILK PRODUCED.

E. B. RICE, Dairy Technologist.

THE relative merits of hand and machine milking, from the viewpoint of clean milk production, is an oft-debated subject among dairymen. Certainly there is usually less ''visible'' dirt in machine-produced milk because of the milk passing direct from the udder into a closed system, and thus largely eliminating contamination from the milker's hands and from dust falling into a pail; but it is to be remembered that it is often the ''invisible''—that is bacterial—contamination from milk residues remaining on imperfectly washed and sterilised surfaces of dairy utensils, which most seriously deteriorates milk and cream.

In the course of a survey of milk supplies to cheese factories, supported by farm instructional visits, covering the period 24th July, 1938-30th September, 1939, information was accumulated as to whether the milk samples from individual suppliers were produced from herds milked by hand or by machine, with a view to ascertaining—

(1) The relative proportions in which hand and machine milking are carried out;

(2) The comparative hygienic quality of the milk ordinarily produced in Queensland from each system.

It is, of course, generally recognised that milk of the highest bacterial purity can be obtained either by hand or by machine, but notwithstanding refinements incorporated in modern milking plants, calculated to improve the sanitary quality of the milk produced, the releaser type of machine, as universally used in Queensland, still possesses, especially in a warm climate, a potential contaminatory source of great magnitude—teatcup assembly, rubber tubing, dropper tubes, and overhead milk pipeline, &c. The scarcity of farm labour, other economic factors and the desire to avoid the drudgery of hand-milking, have inevitably had a tendency to popularise the use of milking-machines by Queensland farmers, and the present investigation was deemed desirable in order to ascertain whether, under ordinary farm methods of cleansing and sterilising milking machines, they are capable of supplying milk of suitable hygienic quality.

Extent of Hand and Machine Milking.

The survey included all suppliers, exclusive of those owning only a few cows and not depending on dairying as a chief source of livelihood, to the forty-eight cheese factories situated on the Darling Downs. The results are set out in Table 1.

TABLE 1.

NUMBER OF HAND AND MACHINE MILKERS.

——	Number.	Percentage.
Hand-milked	381	58·35
Machine-milked	272	41·65
Total	653	100·00

The total number of suppliers was 653, of whom 381, or 58·35 per cent., milked their herds by hand; and 272, or 41·65 per cent., had installed and were using milking machines. As the cheese factories extend over many parts of the Downs, from points situated so far apart as the factory centres in the Toowoomba, Dalby, Bell, Pittsworth, Millmerran, and Warwick districts, the results of the inquiry may be taken as a fairly reliable guide for all the dairy farmers on the Darling Downs—approximately 3,000 in number—and reflect the extensive employment of mechanical milking in that part of the State; and they also probably depict fairly truly the position throughout Queensland. Furthermore, as machines are usually installed on the larger farms, it is reasonable to assume that the actual quantity of milk produced by machine is probably equal to, or only slightly less than that produced on farms where the herds are hand-milked.

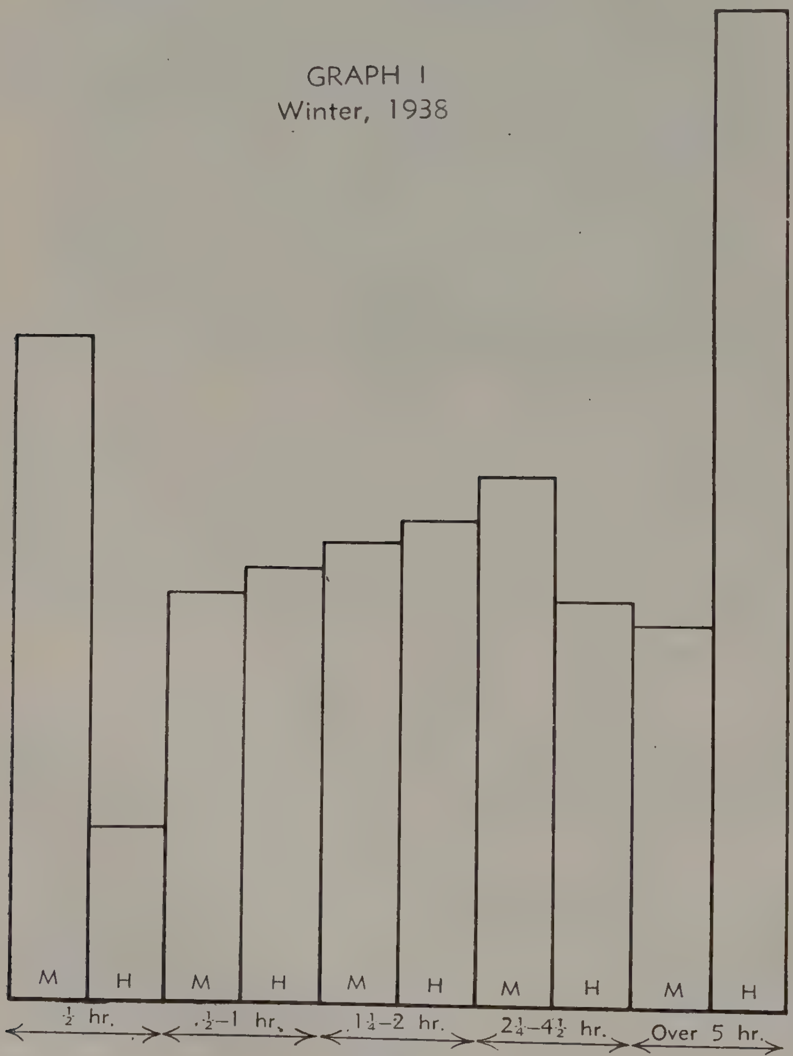

Plate 238.

Hygienic Quality of Hand and Machine Milk.

The methylene blue reductase test (ref. 1) was used to determine the sanitary quality of the milk, the results being classified into five grades:—

Grade 1.—Reducing methylene blue in 5 hours or more.

Grade 2.—Reducing methylene blue between $2\frac{1}{4}$ and $4\frac{1}{2}$ hours.

Grade 3.—Reducing methylene blue between $1\frac{1}{4}$ hours and 2 hours.

Grade 4.—Reducing methylene blue between $\frac{1}{2}$ and 1 hour.

Grade 5.—Reducing methylene blue in less than $\frac{1}{2}$ hour.

All samples may be regarded as surprise samples, the suppliers receiving no prior notification of any intention of visiting a factory. In order to obtain as complete information as possible about each milk suppy for instructional and advisory purposes, the procedure followed was to do methylene blue reductase tests on both night's and morning's milk in the summer period and on night's milk only in the winter, as well as direct microscopic observations, the Wisconsin curd, fermentation and sediment tests. For the purpose of this paper, however, the results obtained in the methylene blue tests on samples of night's milk only were utilised, for it is well known that in milk produced and handled in a careless manner bacterial multiplication is more rapid than in hygienically produced milk and, therefore, tests on samples of night's milk taken upon their arrival at the factory next morning—thus allowing a period for bacterial multiplication of about sixteen hours—more reliably indicate the original quality of the milk than tests carried out on morning's milk in which bacterial development has not become active by the time of its arrival at the factory.

TABLE 2.

RESULTS OF TESTS FOR WINTER PERIOD 24TH JULY-30TH SEPTEMBER, 1938.

Machine-milked samples 110
Hand-milked samples 136
Total number of samples 246

		Distribution of Samples According to Reduction Times—				
		Less than $\frac{1}{2}$ hour	$\frac{1}{2}-1$	$1\frac{1}{4}-2$	$2\frac{1}{4}-4\frac{1}{2}$	5 and over
Machine-milked samples	Number ..	29	18	20	23	20
	Percentage	26·36	16·36	18·18	20·91	18·18
Hand-milked samples	Number ..	11	23	26	22	54
	Percentage	8·09	16·91	19·12	16·18	39·70

For the purposes of *The Dairy Produce Act* the winter period is officially recognised to be from 1st April to 30th September, and the summer period from 1st October to 31st March. Tables, 2, 3, and 4 and accompanying graphs show the results of the tests for the three periods covered by the investigation—portion of winter 1938, winter 1939, and summer 1938-1939.

TABLE 3.

RESULTS OF TESTS FOR WINTER PERIOD 1ST APRIL-30TH SEPTEMBER, 1939.

Machine-milked samples 255
Hand-milked samples 410
Total number of samples 665

		Distribution of Samples According to Reduction Times—				
		Less than ½ hour	½ – 1	1¼ – 2	2¼ – 4½	5 and over
Machine-milked samples	Number ...	18	29	34	57	117
	Percentage	7·06	11·37	13·33	22·35	45·88
Hand-milked samples	Number ..	15	31	45	80	239
	Percentage	3·66	7·56	10·98	19·50	58·30

TABLE 4.

RESULTS OF TESTS FROM SUMMER PERIOD 1ST OCTOBER, 1938-31ST MARCH, 1939.

Machine-milked samples 207
Hand-milked samples 319
Total number of samples 526

		Distribution of Samples According to Reduction Times—				
		Less than ½ hour	½ – 1	1¼ – 2	2¼ – 4½	5 and over
Machine-milked samples	Number ..	115	36	36	17	3
	Percentage	55·56	17·39	17·39	8·21	1·45
Hand-milked samples	Number ..	138	62	50	46	23
	Percentage	43·26	19·44	15·67	14·42	7·21

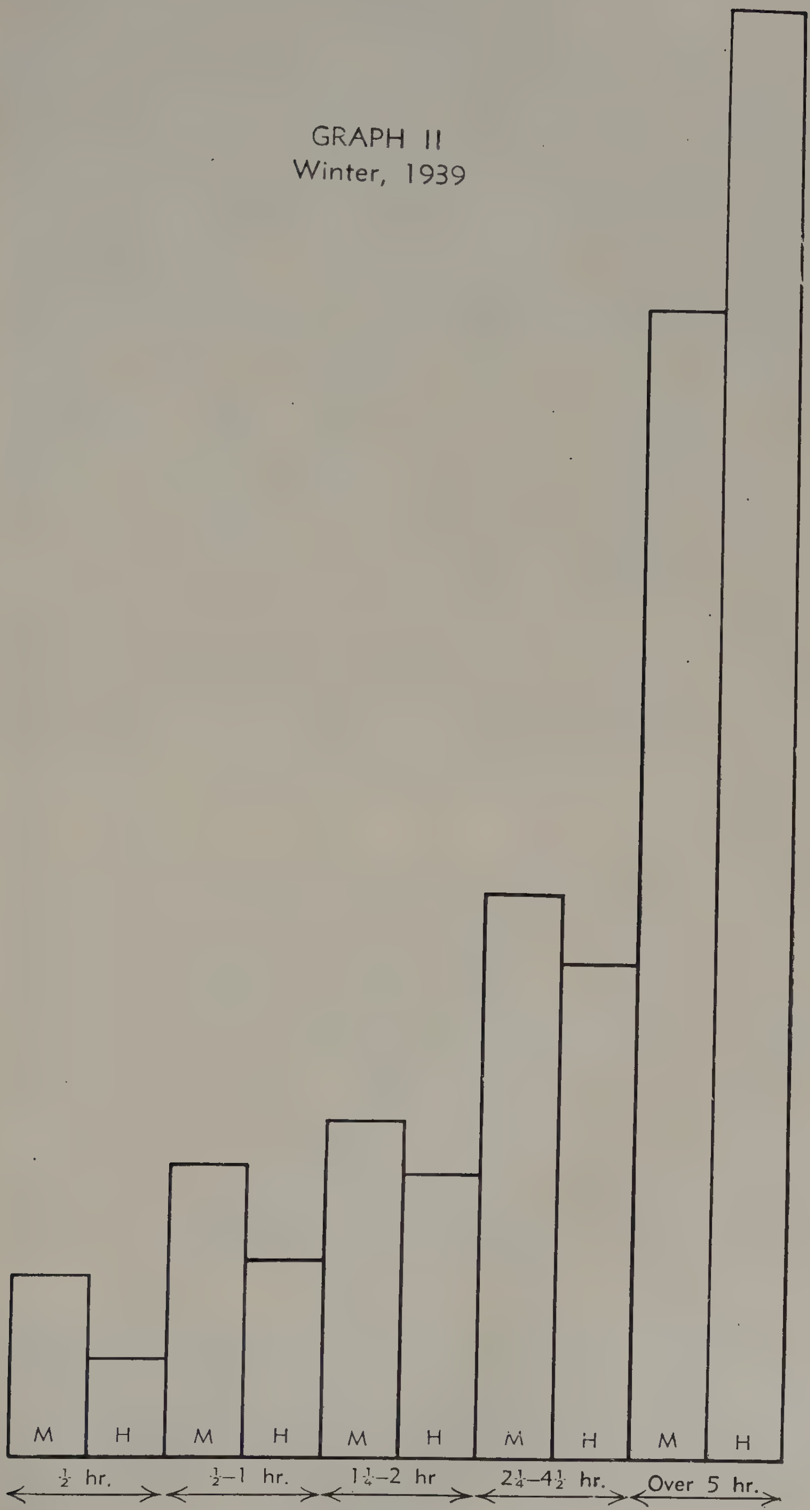
GRAPH II
Winter, 1939
M
H
M
H
M
H
M
H
M
H
½ hr.
½–1 hr.
1¼–2 hr
2¼–4½ hr.
Over 5 hr.

Plate 239.

DISCUSSION.

It will be plainly seen from the tables that in each seasonal period the percentage of samples of machine-produced milk which was placed on the lowest grade (methylene blue test under half-an-hour) is much greater than the percentage of suppliers of hand-drawn milk in this grade. On the other hand, the percentage of samples of machine-produced milk qualifying for the highest grade (methylene blue test over five hours) is considerably lower than the percentage of hand-drawn samples. Thus in the 1938 winter period, 42·72 per cent. of machine-milked samples and 25·00 per cent. of hand-milked samples fell into the inferior grades 4 and 5, the corresponding figures for the 1939 winter period being 18·43 per cent. and 11·22 per cent. Similarly, in 1938 there were 18·18 per cent. machine-milked and 39·70 per cent. of hand-milked samples placed in the highest grade, as against 45·88 per cent. and 58·33 per cent., respectively, in the 1939 winter period. Incidentally, the decided increase in quality in the second compared with the first winter period may be regarded as evidence that farmers are taking an interest in the periodical tests made on their milk and are responding to the departmental efforts to encourage by advisory and instructional methods an improvement in milk quality as the first and chief means towards ensuring an elevation of cheese quality.

Table 4 shows that in the summer period 55·60 per cent. of machine and 43·30 per cent. of hand-milked samples reduced methylene blue in less than half-an-hour, while 27·00 per cent. of machine and 37·30 per cent. of hand samples lasted more than one hour (grades 1 to 3 inclusive). Only 1·40 per cent. of machine-milked and 7·20 per cent. of hand-milked samples were in the highest grade, and producers of such milk are deserving of congratulation on their sound methods of production.

Results of samples taken on the second day of a visit to a factory showed that, except on abnormally hot nights, it is reasonable to expect milk produced under ordinary farm conditions and held overnight to last at least two hours in the test applied to it on reaching the factory next morning. The mean temperature of the night's milk on arrival at the factory next day exceeded 74 deg. F. on a number of occasions. Unless produced with scrupulous care, milk held overnight for fifteen to sixteen hours in this State, where mechanical cooling is not economically justifiable, and arriving at such temperatures will decolourise methylene blue rapidly, because of the excessive development of the original bacterial flora; and the results obtained on such occasions cannot be fairly regarded as representing the usual quality of the factory's milk supply. It is clear from the figures in this table that the problem of producing milk which will keep well in the usual summer evening temperatures experienced in this State is more difficult than that faced by producers in most cheese-producing countries, and can only be solved by exercising the utmost care in production.

Although each table reflects very clearly the inferiority of machine-produced milk in comparison with that drawn by hand, this must not be construed as an indictment of milking machines—for some users of milking machines achieved excellent results—but rather emphasises their serious potential contaminatory influence, and the urgent desirability of the adoption of an improved dairy-shed hygiene technique by the majority of users of milking machines. In this connection, steam sterilisation, recognised to be the most effective method of caring for


GRAPH III
Summer, 1938-39
M
H
M
H
M
H
M
H
M
H
½ hr.
½–1 hr.
1¼–2 hr.
2¼–4½ hr.
Over 5 hr.

Plate 240.

dairy utensils, probably offers an outstanding advantage. Unfortunately, however, so few sterilisers were being used during last summer (and none when the investigation was commenced) that it is impossible to include in this paper any reliable comparison between milk produced on farms using milking machines which are equipped with steam sterilisers and those without them. In view of the increased adoption of sterilisation in recent months, it is hoped to have comparative results at the conclusion of the present summer.

Summary and Conclusions: The most significant facts emerging from the investigation are:—

1. Mechanical milking is adopted on an extensive scale by the suppliers to Queensland cheese factories situated on the Darling Downs, milking machines being installed on almost half the farms.
2. The investigation revealed that one of the serious factors in bacterial contamination and rapid deterioration of milk is the imperfectly washed and sterilised milking machine. Although milk of satisfactory sanitary quality can be produced by the application of a proper cleansing technique, the methods of cleansing and sterilising at present followed by most users of machines are inefficient.
3. Milk produced by milking machines is decidedly inferior to that produced by hand-milking under present farm practices in this State.
4. The importance of an efficient and simply applied technique for washing and sterilising milking machines. Steam sterilisation, as enjoined by recent legislation, is now compulsory.

Reference 1.—This Journal, August, 1938, p. 173-179.

MILK CONTAMINATION.

Numerous researches have established that the two chief sources of bacterial contamination during milk production are the degree of sterility of the utensils used and the personal influence of the milker, but significant contamination occurs from several other sources and may even, on occasion, outweigh that due to the firstmentioned factors. It has to be remembered, too, that the effect of the various factors is cumulative; so it is essential to exercise the utmost care in all operations if the contamination is to be kept down to a minimum.

Two objects, the contaminatory influence of which may appear to be of only minor importance, but which cause infection and which are often overlooked on many farms, are milkers' stools and leg ropes. Since, by merely touching one—either stool or leg rope—bacteria may be transferred from one to the other, it will be apparent that by handling dirty stools and leg ropes before sitting down to milk and then milking without first having washed the hands—a common practice—bacteria may be transferred to the teats and from them into the milk in the bucket, as it is almost impossible to prevent the hands becoming moistened with milk during milking. Both those objects deserve the same consideration as all other causes of infection in clean milk production. It is a common precedure on the best farms in European countries to have metal stools for the milkers and chain fastenings for the cows, or, if wooden stools are preferred, to clean them daily.

Feeding of Working Horses on Cane Farms.*

M. WHITE.

THERE are text book standards for feeding horses when idle, at light, medium, or heavy work, but so many factors enter into successful horse management that set standards, if slavishly followed, may be more harmful than useful. For example, opinions will differ widely as to what is hard work. In ploughing, much depends upon the condition of the ground, the type of soil, the slope, and the season. The state of the farming implements is also important. The condition in which harness is kept, the weather, and, in the tropics, even the colour of the animal, all have a bearing on how hard a horse can be expected to work. Finally, the temperament of the horse and the skill of the driver cannot be too strongly emphasised. It follows, then, that any instructions given must be regarded as guides only, and the common sense of the owner will decide whether or not he is feeding his horses well enough for the work he expects them to do.

For simplicity, the amount of food to be offered daily is expressed in pounds of food to each hundred pounds liveweight of horse. A heavy, well-built draught will weigh from 1,700 to 1,800 lb. A well-grown spring cart type will be in the neighbourhood of 1,100 lb.

For all practical purposes, the cane farmer may class his foods under three main headings:—

(1) Roughage, which is mainly for filling and comfort;

(2) Carbohydrate concentrates for energy production;

(3) Protein concentrates for maintenance of muscle and organs.

Where foods are of good quality, the vitamin content is adequate. Extra minerals should be supplied as rock salt for working horses. Roughage may be supplied as grass, hay, green crops, or cane tops (chop-chop).

The second group includes the cereals, their by-products and molasses. While oats is the best single feed for horses, its use in the canelands is restricted because of other cheaper, and more easily procured grains. Wheat is not widely used though its by-products, bran and pollard are well known. In glut years, with a low ruling price, such as at present, some wheatmeal of good quality may profitably be fed even in maize-producing centres. At present this is also true of barley. Grain sorghums are rapidly coming into prominence and may, within the next few years, become serious competitors of maize. Maize is usually the most valuable grain for horses in the cane areas, but farmers should not be wed to the idea that it is the sole grain for their horses. Molasses, as a cheap by-product of his own industry, has a direct appeal to the cane farmer.

The third group includes:—

(*a*) The seed cake preparations, e.g., linseed, cottonseed, peanut, and coconut meals.

(*b*) Meatworks by-products, e.g., sterilized meat and blood meals.

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* This article summarises two interesting lectures delivered by Dr. White at the Sugar Agriculture and Tractor School, held at Gatton College in January, 1939.

Idle horses can be kept in good condition on roughage alone. If the food is of poor quality, three to four pounds of molasses daily should be given. Horses at light work require about one and one-third pounds of hay, or four to five pounds of green feed, and a half pound of concentrates, for each hundred pound liveweight. Horses at medium work should be fed one pound of hay, or three to four pounds of green feed, plus three-quarters of a pound of concentrates, for each hundred pound liveweight. Horses at hard work need about the same allowance of roughage as when at medium work, but the concentrate allowance should not fall below one pound, and it might easily be one and one-third pounds, per hundred pound liveweight.

It has already been pointed out that the cheapest roughage in the cane areas is grass and chop-chop. Fodder, however, is largely bought, and a note on the relative values of the common chaffs may not be out of place. Lucerne has one notable advantage over the other common chaffs. When it is used, there is no need to include protein-rich foods (cottonseed, linseed, &c.) in the concentrate allowance. However, if the price of lucerne per ton is greater than that of oaten or wheaten chaffs plus the cost of two hundred pounds of protein concentrate, it is, in general, not worth the extra money.

The concentrates fed are chiefly grains, their by-products, and molasses, but these in the absence of lucerne do not provide sufficient protein in the ration. It is therefore necessary to replace one pound of the grain by one pound of protein concentrate for horses at light work. For horses at heavy work, two pounds are substituted.

As maize is the standard grain used in the cane areas, farmers should know how it may be substituted by other energy-producing foods.

Oats.—About seven pounds of oats may replace six of maize. Oats may entirely replace the maize in the ration.

Barley.—Provided the grain is crushed, barley may be substituted almost pound for pound for maize. Better results are obtained by adding a little bran.

Wheat.—Sound wheat may replace an equal weight of maize, but the grain should be crushed. Heavy feeding of wheat should be avoided, as it may cause colic. It may, however, form half the concentrate mixture for horses on hard work, if the horses are accustomed to it gradually.

Grain Sorghums.—Crushed grain sorghums may be used in place of maize. In the absence of green feed some bran should be included to counteract the constipating effect of sorghum.

Molasses.—Three pounds of heavy molasses may be used in place of two of maize. Molasses should not entirely replace grain in the ration. One-half of the grain ration for hard working horses may be replaced by molasses in the above proportions.

The protein-rich concentrates most commonly used are linseed, cottonseed and peanut meals. These are interchangeable. When coconut meal is fed, only the best quality should be used. It falls slightly below linseed meal as a source of protein but is a richer source of energy. Meat meal of the best quality only, should be used for horses. It should be introduced gradually. A little over one pound of high-grade meat meal will replace two pounds of vegetable protein meals.

In arranging the three feeds for working horses, it is important to reserve about one-half of the total daily roughage for the evening meal. The morning and midday feeds are eaten just before work starts, and these feeds should contain between them, about three-quarters of the energy-producing foods, i.e., the concentrates. Too much roughage in these feeds prevents the horse from eating sufficient concentrates in the time at his disposal—particularly if he is a slow eater. The long overnight spell gives the horse time to digest the bulky evening meal.

Some horses are inclined to "bolt" their food. This may most readily be overcome by using a shallow feedbox at ground level. This makes the food more difficult to "bolt." Another plan, if the corn is grown on or near the farm, is to feed it in cob. Failing the above, the simplest method is to place two or three large smooth stones in the feedbox.

An important point, too often missed in feeding horses, is never to feed musty material, and always to clean out the boxes. The nose bags too should receive attention. They should be turned inside out after use, and at least once a week steeped in soap suds and rinsed clean. Nothing puts a horse off his feed more than the decomposing remnants of previous feeds.

On idle days the concentrate part of the ration *must be* reduced to at least half the normal amount.

The watering of working horses is important. Water in the morning. Just before the midday feed a short draught should be allowed. Water again after the feed. After the day's work, and before unharnessing, the horse should be watered again. If green feed is supplied in the evening meal, horses may not require any more water for the day. If the feed is dry, they usually like another drink.

MAKE THEM PULL TOGETHER.

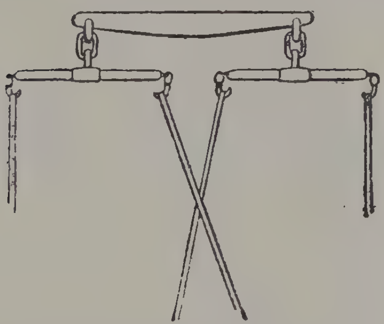


Plate 241.

Here is a device which has been found very successful in breaking in young horses to pull together. Simply unhitch the inside traces and cross them, as shown in the drawing.

Charcoal Gas for Farm Tractors.*

SOME time ago prominence was given in the Bulletin to a newly constructed tractor which was designed to operate on suction gas, generated from charcoal. Though the trials of this unit appeared to be satisfactory, it is understood that the firm which constructed it does not propose to proceed further with the unit.

Interest in some emergency form of fuel, particularly for use in farm areas, has again been stimulated by the outbreak of hostilities, which may eventually threaten the continuity of supply of motor fuels to this country. At the same time, it is probable that farmers in some areas, where wood is plentiful and fuel oils are expensive, might adopt the charcoal producer unit even for normal use. An interesting article on this subject appeared in a recent issue of the "Agricultural Gazette of New South Wales," and the more important features of this contribution are presented here in brief.

Experimentation with charcoal fuel has been carried out over a number of years, but until recently, successes have been shortlived as a result of ineffective cleaning, resulting in the deposition of tar in the cylinders, and excessive wear due to solid particles of fuel entering the engine. The rapid burning out of grate and fire box was a further shortcoming of earlier types. Two modern burners have been demonstrated in New South Wales during the past two years, and 26 of these units have been put into operation since May last, with a substantial number about to follow. Better cleaning apparatus has removed the tar and dirt problem, and some owners, after limited experience, state that the engine wear is now less than with oil fuel.

Cost figures, based on data from 15 owners, showed:—

Per 10-hour Day.	Full Load.	Light Load.
Charcoal used	4-7 bags.	3½-6 bags
Cost	5s. to 8s. 9d.	4s. 4½d. to 7s. 6d.
Kerosene used	16-24 gallons.	15-20 gallons
Cost	20s. to 30s.	18s. 9d. to 25s.
Actual averages—		
(*a*) Charcoal	6s. 6½d.	5s. 1½d.
(*b*) Kerosene	25s. 1d.	21s. 5d.

With charcoal gas, the lubricating oil retains its body and colour longer, as it is not subject to dilution. Some owners claimed that the oil retained its viscosity and colour for upwards of 150 hours. The average oil costs for the units under review showed—

	s.	*d.*
With charcoal	1	6 per day.
With kerosene	4	4 per day.

On the basis of a 70-hour week, on full load, the saving in fuel and oil with the charcoal unit was therefore more than £7 per week.

* From *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), October, 1939.

The cost of charcoal is set down at 1s. 3d. per bag of 50-lb., but it is suggested that this could be reduced where the farmer produces his own. Farmers placed nearer the burning plant are able to secure bulk supplies for 1s. 1d. per bag.

It is found that a loss of power of some 13 per cent. is experienced when kerosene is replaced by charcoal gas. It is pointed out that this could be overcome with a cylinder bore ¼ inch greater than normal: in some cases, little loss of power could be detected where the bore was increased by only ⅛ inch.

It is claimed that, with proper care, the fire risk for crop harvesting was not more than when using kerosene. In Western Australia, a large insurance company does not differentiate between kerosene and charcoal fuels in fixing insurance premiums.

It is admitted that charcoal is less convenient than kerosene, for the following reasons:—

1. Loss of time; average, 30 minutes per day;
2. Unit more bulky and less rigid; requires more frequent servicing;
3. Visibility in judging steering space reduced;
4. Accessibility of engine and transmission reduced;
5. Two stays have to be removed to operate belt and pulley drive.

Some farmers consider the plant equally or more convenient for the following reasons:—

1. Simplicity of operation;
2. Not same trouble in maintaining fuel supply;
3. Engine may be allowed to idle for longer period without over-heating, and no oil dilution;
4. No cash outlay if farmer burns his own charcoal.

It is further stated that with charcoal, cleaning the plant and sieving and burning charcoal is a dirty job; when the charcoal burns low, the upper half of the burner becomes very hot, which may cause discomfort in hot weather. On the other hand, there are no engine fumes, and the engine runs cooler and more smoothly, with less noise.

Should any owner not be satisfied with charcoal gas, it is pointed out that a change back to kerosene fuel may be made by fitting the normal sleeves and pistons. Moreover, the charcoal gas requires a hot spark, and the magneto must be in excellent condition for the purpose.

Repairs to the charcoal unit involve renewing the grate every two or three years, and the fire box every four or five years. The cost of supplying and fitting a charcoal gas unit amounts to about £105, to which must be added £15 to £20 for converting the engine to suit the charcoal gas fuel.

A significant fact was that all owners interviewed by the writer of the article were entirely satisfied with the functioning of the units.

H.W.K.

Fodder Canes.*

ARTHUR F. BELL.

THE Sugar Experiment Stations Act gives authority for the control of plantings of fodder canes and this control is being exercised within mill areas.

A mill area is defined as the general area, of both assigned and unassigned land, which embraces the lands assigned to the particular mill. That is, for example, if the assigned land ran in two forks up adjacent creeks, then the unassigned area between these forks would be included in the "mill area."

Fodder canes are just as likely to harbour diseases as canes grown for milling and consequently it would be illogical to impose control upon planting of milling canes, while ignoring fodder canes. Accordingly, cane which is grown for fodder purposes within a mill area must be either one of the varieties approved for milling or an approved fodder cane as set out hereunder:—

Variety of Sugar-cane.	Mill Area.
Uba, Co. 290, and "Improved Fodder Cane"	Mossman, Hambledon, Mulgrave, Babinda, Goondi, Mourilyan, South Johnstone, Tully, Macknade, Victoria, Invicta, Kalamia, Pioneer, and Inkerman.
Uba and "Improved Fodder Cane" ..	Proserpine, Farleigh, Racecourse, Pleystowe, Marian, Cattle Creek, North Eton, and Plane Creek.
90 Stalk, "Improved Fodder Cane," and C.S.R. 1 (also known as E.G.)	Bingera, Fairymead, Millaquin, Qunaba, Gin Gin, Isis, Maryborough, Mount Bauple, Moreton, Eagleby, and Rocky Point.

Returns received from canegrowers earlier in the year reveal the fact that comparatively few grow purely fodder canes and consequently some difficulty may be experienced in obtaining supplies, but the variety 90 Stalk, which is approved for southern mill areas, may be obtained from the Queensland Acclimatisation Society, Lawnton.

The present list of approved fodder canes is only tentative and will probably be revised as soon as further tests are made. Heretofore, the Bureau has not paid attention to this class of cane, but it is probable that a number of our discarded seedlings could be utilized for this purpose, especially some of the vigorous types which are discarded on account of somewhat low sugar content from the milling point of view. In future, our field officers will bear in mind the question of fodder canes when selecting seedlings or when setting out disease resistance trials.

We have mentioned above that this restriction on the growth of fodder canes applies to both assigned and unassigned land within a mill area. Canegrowers receiving this Bulletin would render a good service to their neighbours if they brought this information before the notice of such neighbours as grow cane for fodder purposes but are not suppliers to a sugar mill.

A number of enquiries have been received regarding elephant grass, but it should be noted that there are no restrictions on the cropping of this plant nor do restrictions on fodder canes apply to dairying districts outside the general cane areas.

* From *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), October, 1939.

Composition of Superphosphate (Super) and Nauru Phosphate.

R. A. TAYLOR, A.A.C.I., Inspector and Examiner, Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Investigation Branch.

NUMEROUS enquiries as to the meaning of terms in common use on superphosphate labels demonstrate the necessity of publishing information with respect to the composition of this material.

Terms repeatedly used are as follows:—

20·5 per cent. Water-soluble Phosphoric Acid;

22·0 per cent. Super;

45·0 per cent. Soluble Phosphates;

48·0 per cent. Tricalcic Phosphate;

40·0 per cent. Gypsum.

As will be seen from a study of the composition of superphosphate, one of these terms (40 per cent. Gypsum) is definitely erroneous, while several of the others are misleading.

In the chemical estimation of phosphates the percentage of phosphoric anhydride (P_2O_5) is ascertained. This gives a common value for all phosphates for comparative purposes.

Phosphoric anhydride (P_2O_5) is usually called phosphoric acid, and throughout this article this latter name is adhered to—in accordance with common practice.

If true chemical nomenclature is adhered to, however, phosphoric acid is really the material formed by the addition of water to phosphoric anhydride. It is mentioned later, under the designation "free acid"; the chemical formula is H_3PO_4.

Three forms of calcium ortho-phosphate occur in superphosphate. These three forms are—

Monocalcic phosphate—$CaH_4(PO_4)_2$.

Dicalcic phosphate—$Ca_2H_2(PO_4)_2$.

Tricalcic phosphate—$Ca_3(PO_4)_2$.

The firstnamed—monocalcic phosphate—is soluble in water, and is present in superphosphate.

The second is largely soluble in citric acid solution, and is the active constituent in basic phosphate.

The third is largely insoluble in citric acid solution, and is present in Nauru phosphate rock and bone.

It is not possible to completely separate the three forms of calcium phosphate from one another on a basis of "soluble in water," "soluble in citric acid solution," and "insoluble in citric acid solution," but the monocalcic phosphate can be taken as being completely soluble in water, while the other two forms are insoluble in water; where small quantities of dicalcic and tricalcic phosphates are present, however, as in superphosphate, the "soluble in citric acid" method may be taken as giving a representation of the proportion of these two forms present.

It must be emphasised, however, that the whole of the tricalcic phosphate in Nauru phosphate rock or in bone is not citric acid insoluble; nor is the whole of the dicalcic phosphate present in basic phosphate or other materials soluble in citric acid solution.

Nauru Phosphate Rock.

Nauru phosphate rock is a natural product obtained from Nauru Island. From this raw material the superphosphate sold in Queensland is made.

The following table demonstrates the composition of a typical sample of Nauru phosphate (last column) as deduced from the actual analysis (first column) :—

NAURU PHOSPHATE ROCK.

TABLE I.

Actual Analysis.		Allotment of Findings. Phosphoric Acid (P_2O_5).	Allotment of Findings. Lime (CaO).	Allotment of Findings. Loss on Ignition.	Composition.	
	%	%	%	%		%
Total Phosphoric Acid (P_2O_5)	39·8	39·0	46·1	..	Tricalcic Phosphate [$Ca_3(PO_4)_2$] ..	85·1
Iron and Alum. Oxides [$(FeAl)_2O_3$]	0·7	0·8	..	..	Iron Al. Phosphates [$(FeAl)PO_4$] ..	1·5
Fluorine (F)	0·5	..	0·7	..	*Calcium Fluoride (CaF_2)	1·0
		..	2·5	2·0	Calcium Carbonate ($CaCO_3$)	4·5
		..	**1·1	..	Calcium Silicate ($CaSiO_3$)	2·3
		..	..	1·0	Organic Matter	1·0
		39·8	50·4	3·0		
Total Lime (CaO)	50·4					
Loss on Ignition [Carbon-dioxide (CO_2)—2·0]	3·0					
Free Water	1·5	..	..	..	Free Water (H_2O)	1·5
					**Silica (SiO_2), &c.	3·1
						100·0

* It is possible that the fluorine is actually present as calcium fluo-phosphate, as in certain American rock phosphates.

** Certain allotments are necessarily arbitrary. SiO_2 was not estimated, but is generally present in excess of 3 per cent. The CaO has been divided between phosphate, carbonate, fluoride, and silicate, the first three being calculated equivalents of the respective acid radicals, and the silicate receiving the quantity remaining. The expression Silica (SiO_2), &c., covers silica and elements present in small amounts but not estimated.

The amount of phosphoric acid present in the above is 39·8 per cent.—all being in the water-insoluble form. It should be noted that, on account of this insolubility, fineness is an important factor governing the availability of the phosphoric acid.

To convert the insoluble tricalcic phosphate in Nauru phosphate rock to water-soluble monocalcic phosphate, a calculated amount of sulphuric acid is added, and superphosphate—an abbreviation of the correct term ("calcium superphosphate")—is formed.

Superphosphate.

The following table sets out the composition of a typical sample of superphosphate as deduced from the actual analysis (first column) :—

SUPERPHOSPHATE.

TABLE II.

Actual Analysis.		Allotment of Findings.				Composition.	
		Phosphoric Acid (P_2O_5).	Lime (CaO).	Sulphur trioxide (SO_3).	Water (H_2O) (Combined).		
	%	%	%	%	%		%
Water-sol. Phosphoric Acid (P_2O_5)	20·5	0·8	..	..	..	*Free Acid (H_3PO_4)	1·1
		19·7	8·1	..	2·5	*Monocalcic Phosphate [$CaH_4(PO_4)_2 \cdot H_2O$]	35·0
Cit.-sol. Phosphoric Acid (P_2O_5)	0·5	0·5	0·4	..	0·3	Dicalcic Phosphate [$Ca_2H_2(PO_4)_2 \cdot 4H_2O$]	1·3
Cit.-insol. Phosphoric Acid (P_2O_5)	1·0	1·0	1·3	..	..	Tricalcic Phosphate [$Ca_3(PO_4)_2$] ..	2·3
		..	1·9	2·7	1·2	Gypsum (Dihydric Calcium Sulphate $CaSO_4 \cdot 2H_2O$)	5·8
		..	17·3	24·7	..	Anhydrite (Anhydrous Calcium Sulphate $CaSO_4$)	42·0
Fluorine (F)	0·3	..	0·5	..	..	Calcium Fluoride (CaF_2)	0·7
Iron and Alum. Oxides [$(FeAl)_2O_3$]	1·0	..	..	1·0	..	Iron-Aluminium Sulphate [$(FeAl)_2(SO_4)_3$]	2·0
Silica (SiO_2) and Insoluble	2·2	..	..	..	..	Silica (SiO_2) and Insoluble	2·2
Free Water (H_2O) ..	7·6	..	..	..	..	Free Water (H_2O)	7·6
		22·0	29·5	28·4	4·0		100·0
Lime (CaO)	29·5						
Sulphur Trioxide (SO_3)	28·4						
Combined Water (H_2O)	4·0						

* The water-soluble P_2O_5 is actually contained in the free acid and the monocalcic phosphate.

The actual chemical forms—in relation to degree of hydration—in which the mono, di, and tri calcic phosphates occur in superphosphate are set out variously by different authorities.

It is considered, however, that the forms as set out in the Journal of Industrial and Engineering Chemistry Anal. Editn., Vol. 7, p. 401, are correct—except for the tricalcic phosphate, which is probably a portion of the unchanged Nauru phosphate rock, and consequently would be in the anhydrous form $Ca_3(PO_4)_2$.

The representative formulæ are, therefore, accepted for purposes of this article as—

Mono—$CaH_4(PO_4)_2 \cdot H_2O$.

Di—$Ca_2H_2(PO_4)_2 \cdot 4H_2O$.

Tri—$Ca_3(PO_4)_2$.

The free acid (H_3PO_4) shown in Table II. is actually water-soluble, and its equivalent as phosphoric acid (P_2O_5) is, therefore, included in the 20·5 per cent. water-soluble phosphoric acid, shown on the typical label.

A true statement of the water-soluble phosphoric acid would, therefore, be—

19·7 per cent. water-soluble phosphoric acid (P_2O_5) as mono-calcic phosphate.

0·8 per cent. water-soluble phosphoric acid (P_2O_5) as free phosphoric acid.

20·5 per cent. total water-soluble phosphoric acid (P_2O_5).

It will be seen from the table that, although the object of the process is to obtain water-soluble phosphoric acid (monocalcic), small quantities of dicalcic phosphate and tricalcic phosphate are present. These are really "impurities" due to the great difficulty economically of making any commercial process 100 per cent. perfect.

As, however, the water-soluble phosphoric acid is the "object" of the process, the di and tri calcic forms are not recognised by the Queensland Fertilisers Act of 1935. In fact, a superphosphate guarantee reading 20·5 per cent. water-soluble phosphoric acid (P_2O_5), and *nothing else*, is considered ideal and leads to no confusion.

It should be noted that excessive fineness is of no value with superphosphate as contrasted with Nauru phosphate rock, which requires to be finely ground—as stated previously.

The calcium sulphate is largely present as anhydrite ($CaSO_4$), only a small portion being in the form of gypsum ($CaSO_4{\cdot}2H_2O$). According to A. P. Belepol'ski and A. A. Taperova—Journal Chem. Ind. (U.S.S.R.), 15, No. 3, 44 (1938)—X-ray studies show that, even after superphosphate has been stored for two years, the calcium sulphate is still present chiefly in the form of anhydrite.

In the light of the above information, it is now possible to review the terms quoted in the beginning of this article.

20·5 Per Cent. Water-soluble Phosphoric Acid.

As already stated, this refers to the phosphoric acid (P_2O_5) present as monocalcic phosphate and free acid in the superphosphate.

It is the *only guarantee* required to be stated on the label by the Queensland Fertlisers Act of 1935.

22 Per Cent. Super.

This refers to the total phosphoric acid (P_2O_5) and includes, as well as water-soluble, the citric acid-soluble and insoluble phosphoric acid present in the dicalcic and tricalcic phosphates. This term is disregarded by the Queensland Fertilisers Act.

45 Per Cent. Soluble Phosphates.

This is the figure obtained by calculating the 20·5 per cent. phosphoric acid (P_2O_5) present as monocalcic phosphate and free acid to its equivalent as tricalcic phosphate. This expression is not used in Queensland.

48 Per Cent. Tricalcic Phosphate.

This figure is obtained by calculating the 22 per cent. total phosphoric acid (P_2O_5) present in all forms to its equivalent as tricalcic phosphate. This expression also is not used in Queensland.

40 Per Cent. Gypsum.

Actually in superphosphate, only a small percentage of gypsum (dihydric calcium sulphate) is present, the bulk of the calcium sulphate being in the anhydrous form—anhydrite. As this portion of the super. is a "by-product" only, it is actually of little importance.

In conclusion, the following point is worthy of interest:—

Nauru phosphate rock is an unadulterated natural product; superphosphate is manufactured in Australia from finely-ground Nauru phosphate rock and sulphuric acid. It will thus be observed that superphosphate, as described herein, does not contain "filler" in any sense of the word, the whole of the material as sold being the product obtained from the process without addition or admixture of any kind.

CULTURES FOR THE INOCULATION OF GREEN MANURE CROPS.

Canegrowers are reminded that cultures for the inoculation of seeds of cowpea and Poona pea seed are again available on application. This service was inaugurated last year and was very favourably received, and cultures sufficient for the inoculation of nearly 2,000 acres of Poona pea and cowpea were despatched to canegrowers in all parts of the State. A number of the recipients of these cultures have written expressing their great satisfaction with the crops produced after inoculation.

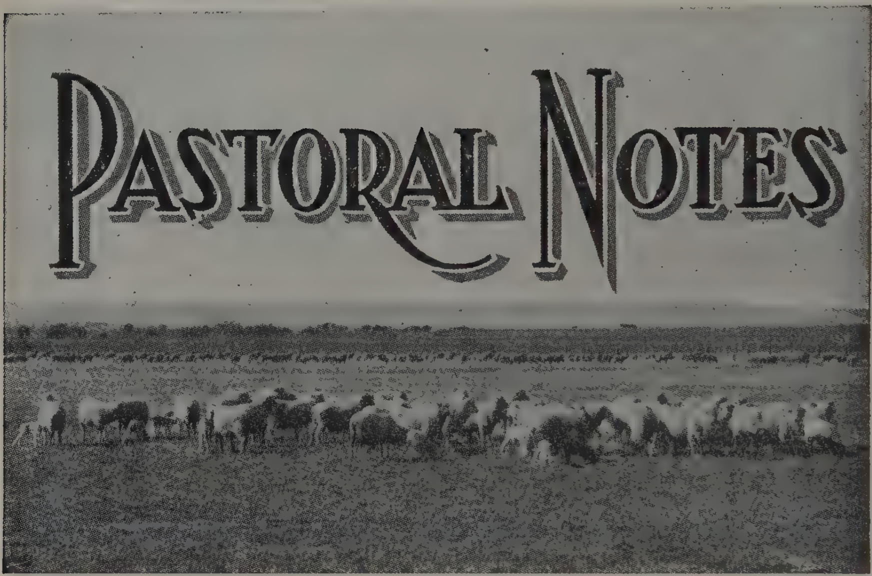
The inoculation of the seed is a very simple matter and full directions are forwarded with each lot of cultures. The cultures will keep satisfactory for about a month if stored in a cool dry place, but as far as possible they should be ordered for delivery just prior to the proposed date of planting.

Leguminous crops inoculated with the right type of nitrogen-fixing bacteria can obtain their supplies of nitrogen from the air instead of from the soil and, consequently, when such a green manure crop is ploughed in the soil is enriched by just that much nitrogen. These bacteria can live in the soil for a considerable period and the crop may become inoculated naturally after planting, but even if it does become inoculated, and forms root nodules, it does not follow that the particular bacteria are the most efficient strain. Undoubtedly the best practice is to make sure that the most efficient strain of bacteria is present by the simple practice of inoculating the seed with a tested strain before planting.

Inoculation of the seed is, of course, only one step towards ensuring a good green manure crop; it is still necessary to plant sound seed in a good seed bed, have soil acidity corrected, and have suitable conditions of moisture. To obtain best results, also, the green manure should be planted as soon as practicable after ploughing in trash and not after a bare fallow.

Applications for cultures should be made to The Director, Bureau of Sugar Experiment Stations, Brisbane; each application should be accompanied by the sum of one shilling and should state the number of bushels of seed it is desired to inoculate.

A.F.B.



Horse Botflies.

AS summer approaches horses may become greatly troubled by botflies. These flies are bee-like in appearance and possess two wings and a slender pointed abdomen. When laying eggs, the female fly hovers around the horse with the abdomen curved beneath the body. This has given the erroneous impression that the botfly stings, but its abdomen is held in this position merely to facilitate the deposition of its eggs. The eggs are laid on the hairs of the chest, throat, mane, shoulders and legs of the horse, but more frequently on the hairs of the throat and the inside of the forelegs.

In time, the larvæ develop within the eggs and hatching occurs when the horse licks or rubs the spot on which the eggs are present. In some way or other, the hatched larvæ reach the mouth of the horse and then burrow into the flesh of the tongue and cheeks. Here they remain for a little while, but eventually make their way into the stomach. When fully grown they are passed out of the animal with the dung, burrow into the ground and pupate. In the pupæ the adult botflies are formed and they emerge after a period of a few weeks.

Botflies are harmful to horses in two ways. Firstly, the horse instinctively recognises them as enemies and makes desperate efforts to prevent the female botflies approaching and laying eggs. During the botfly season, horses thus become very difficult to manage in harness, and may also hurt themselves in their attempts to avoid the flies. Secondly, the bots in the stomach may cause serious trouble. Each bot has a pair of stout hooks in its mouth, and also rows of hooks around its body. These hooks irritate the lining of the animal's stomach, and may cause ulcers and other ill-effects.

Various methods have been devised to prevent the botflies from approaching horses and laying eggs. One of the simplest and most successful is a piece of canvas attached to the horse's noseband and headstall so that it covers the throat completely. Deep sheds or brush shelters also will give protection, as the botflies will not follow the horse out of the sunlight.

For the removal of the bots from the horse's stomach, carbon bisulphide is advised. This is given in a capsule after twenty-four hours' starvation at the rate of 6 cubic centimetres—about one ordinary teaspoonful—for every 250 lb. weight. The best time to treat a horse for bots is about May or June, for at this time of the year all eggs on the body will have hatched and, as no flies are about, the horse cannot become reinfested immediately after treatment.

CLASSING THE WOOL CLIP.

As the great bulk of the wool produced in Queensland is merino, there is no great difficulty in having it classed properly. Most Queensland pastoralists keep their sheep in as good condition as seasonal and other circumstances permit, and do everything else necessary to produce a good clip of wool.

To add to the benefit of good flock management, the clip should be classed to best advantage. The large flock owner realises that it pays to obtain the services of a highly qualified classer to do the work. It has been the get-up of these clips which has gained for Queensland clips the confidence of buyers. To retain this confidence and to have it extended to manufacturers is most important. It should be understood that station brands are well known to both buyers and manufacturers, and if the wool is classed and baled in keeping with the requirements of the trade, the owner is bound to obtain the full benefit of a properly classed clip.

Some buyers deal chiefly in long staple, and others require shorter wools, and they will buy with confidence if they are sure of getting the type they require, and not a mixture of lengths and qualities. Yield also has a considerable influence on values; and as values are based on suitable length and spinning quality, as well as yield, the importance of maintaining lines of even standard should be obvious. As the wool is purchased on a clean-scoured base, the purchaser of greasy wool must calculate the percentage of the clean product he will obtain, therefore the more even respective lines are in length, spinning, quality, character, soundness, colour and condition, and yield, the more accurate he will be in appraising the true value of each class. Not only in large, but also in the smaller clips correct classing is important, especially under changing selling conditions. Arrangements have been made for the purchase of the whole of the Australian wool clip by Great Britain, with control of selling procedure vested in a central wool committee.

All wool has now to be submitted for appraisement, and experts appointed by the central committee are responsible for its valuation. This means that classing to obtain the best returns for the grower will be even more necessary than under the former system of auction sales, although both brokers and their experts receive and handle clips as usual.

Where small owners are concerned, the expense of a qualified classer may not be warranted, especially where family labour is utilised. To assist them, the Department of Agriculture and Stock is prepared to instruct them in the classing of their own clips.

Farmers' Wool Scheme.—A scheme also is in operation which is limited to those who run 1,500 sheep or less, British breeds and crosses, and odd lots, bags and butts from any holding, for which 10s. per bale is charged for classing. The only preparation necessary is the removal of wet stains. An advance of 60 per cent. of the estimated value of the wool free of interest to owners running less than 1,500 sheep is made on consignments.

—*Jas. Carew.*

CATTLE FATTENING.

There are large tracts of well-grassed land in South-eastern Queensland on which fattening of bought store cattle is practised. These cattle are usually animals which fatten into "heavies." Older stock can "handle" roughage much better than yearlings, and it takes less time and trouble to get them ready for market; but, in general, they do not give as good a net return as "baby beef."

The reasons are—

(1) Buying of stores is a more speculative business and the outlay greater.

(2) Disease, drought, and other retarding influences make the money loss, if any, greater.

(3) The trade does not favour "heavies."

(4) Although the relative cost per 100 lb. is higher with the "young stuff," more can be bought for the same money.

(5) The young animal lays on both flesh and fat—i.e., it fattens while it grows.

(6) The trade pays more for the finished carcase.

(7) There is *always* a market for well-finished lightweights.

There are certain requisites for turning off baby beeves the year round—

(1) On the part of the buyer, a sound knowledge of what "good doers" look like;

(2) On the property—well-planned subdivision, improved pastures, cultivation, and fodder conservation.

Improvements require a considerable outlay of capital, but in all cases where management has been sound the returns have made it well worth while.

It should always be remembered that the improvements are permanent, and that they enhance the value of the property.

SHEEP ON THE FARM.

Sheep should have a permanent place on any farm on which conditions are suitable. One of the advantages of sheep is that they provide two distinct sources of income annually—wool and mutton—besides their natural increase.

In Queensland, merino sheep constitutes about 97 per cent. of our total number. This breed is especially adapted to conditions in the central and western districts of the State, but when forced to breed and develop in an unsuitable environment, constitutional weakness is a real risk.

British breeds have been developed and maintained under conditions where environment has influenced adaptability to Queensland conditions. In mixed farming districts these breeds—especially the pure-bred rams—can be used with advantage. The Corriedale originated in New Zealand, and the improvement of the breed has been progressive both there and in Australia. In Queensland, the Corriedale is regarded as a dual purpose sheep coming between the merino and pure British breeds, overlapping both in adaptability to a considerable degree.

In sheep breeding, local conditions should decide the system of production.

Sheep-breeding under diversified farming conditions where the British breeds are used is entirely different from merino-breeding in the West. The merino is bred under purely pastoral conditions, and the progeny is retained for wool and mutton production. With the imported mutton breeds, the aim of the farmer is to dispose of the progeny at the earliest marketable age. To do this successfully, two major points should be observed—

(1) The use of pure-bred rams of quick-maturing qualities suitable to location and conditions.

(2) Availability of suitable pasture or cultivated crops for ewes as soon as their lambs are dropped, and for topping off the lambs.

Other considerations of importance are the suitability of the ewe flock for wool production as well as for breeding; economy in pasturing the ewe flock from the time the lambs are taken off until the next drop of lambs; the general health of the flock and freedom from parasites; fodder provision for carrying the flock successfully through periods of scarcity; and culling the breeding flock for age while they are still capable of being fattened and sold at a profit. To start successfully in breeding, whether for wool, mutton, or for fat lambs, healthy sheep are essential. This may mean paying more for young sheep, but it will generally prove the best and safest policy.

THE CORRIEDALE AS A FARMER'S SHEEP.

As an all-round general utility farmer's sheep, nothing beats the Corriedale. There is no better ewe for the production of fat lambs. Joined with one of the Downs rams—such as the Dorset Horn or the Southdown—the lambs they produce are first-class.

Corriedale ewes are docile, good doers, and great milkers.

In Queensland there is a tendency to breed the Corriedale too fine, thus defeating the object for which the breed was evolved.

No finer wool than a 56 counts should be tolerated in the Corriedale stud. To get the fleece as fine as merino counts can only be done at the expense of constitution—one of the Corriedale's most important characteristics. Growers of pure-bred Corriedale sheep would be well advised to cull rigorously any animal showing too fine a tendency.

SOME EVILS OF OVERSTOCKING.

Stocking capacity is a point in the management of pastoral lands which is often neglected. It should be accepted as a truth that two well-fed sheep will give a greater monetary return than three half-fed animals and more than four half-starved sheep. The return from properly nourished sheep would be probably even higher were their greater resistance to internal parasites taken into consideration. Some of the evils of overstocking—altogether apart from total losses—are loss in wool per head, as the result of unthrifty growth; a possible break in the staple; poor lambings; a distinct loss on those animals which should be turned off as fats; and last, but not least, the erosion of country, of which overstocking is an important cause.

From the point of view of returns alone, it will be found that over a period of years a property stocked well within its carrying capacity will average far better returns than one where overstocking is the policy of the management.

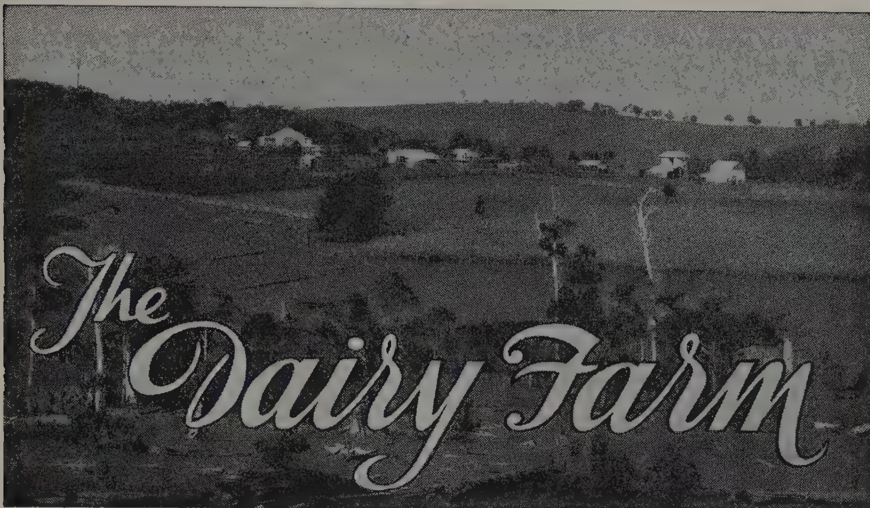
Some graziers put forward the argument that, taking lean years into consideration, they have to stock to over-capacity to make ends meet. This policy is, however, considered to be wrong, especially when returns are averaged over a number of years.

CARELESS BRANDING.

Slovenly methods in the branding of stock, particularly cattle, are in evidence far too frequently, the results being most undesirable in many respects. Quite often the carelessness with which the branding irons are applied involves cruelty, although it may be unintentional.

It is cruel to hold the hot iron on an animal until the skin is burnt through, and it cannot be justified on the score of necessity. This practice may be due to underheated irons, but, on the other hand, it may be due to over-hot irons held on the skin a fraction of a second too long, or with too much pressure. Such branding causes blotches, and very often the actual letters or figures are undecipherable. The skin in the area involved is ruined for tanning purposes, and festering sores may result. Identification of the animal by means of such a brand is rendered very difficult, if not impossible.

It is a well-known fact that, on large stations, where thousands of calves are branded yearly, and where speed is a factor in the handling of large mobs, the standard of branding is much higher than on some small holdings—such as farms, where only two or three calves may be branded at irregular periods.



Dairy Cattle—Pure-bred or Grades?

THE question is often asked: Which is the more profitable—pure-bred or grade dairy cattle? The difference in value of pure-bred and high-grade dairy cattle lies in the higher selling price of the pure-bred. Dairy farms which are so equipped that they can handle the record work effectively will find more profit in pure-bred than in grade cattle. There is a steady market for high-quality pure-bred cattle at prices which net good returns to the breeder. Whether pure-bred stock will show the best results with any particular dairy farmer depends, however, on his keeping authentic records, and also on his ability as a salesman. Pure-bred cattle which a breeder is unable to sell are no more valuable to him than an equal number of good grades.

A herd of carefully selected grade cows will produce as heavily as the average pure-bred herd, for the reason that they can be culled more closely, as their lower value does not encourage keeping an animal which is not a profitable producer. There is always a good demand for the female offspring at payable prices. Any person going in for dairying for the purpose of producing milk or cream, and not with the idea of gaining a large part of his income from the sale of stock, may do quite as well with grades as with pure-breds.

As in most things, success with dairy cattle depends on the individual farmer himself, and whether grade or pure-bred cattle are more desirable can be settled only when the particular conditions surrounding the individual case are considered.

It is sometimes stated that grade cows are better than pure-bred animals. This is not so, but it is true that some grades are better than some pure-bred stock.

One very important fact to remember, however, is that the herd sire should always be a pure-bred. Unfortunately, this is not sufficiently understood by some Queensland dairy farmers, and this accounts to a very large extent for the poor type of dairy cattle one sometimes sees when travelling through the country.

VARIATIONS IN CREAM TESTS.

Many dairy farmers sometimes wonder why their factory returns show variations in the fat tests of their cream. Actually, variations are bound to occur.

Conditions under which milk is separated lead to changes in cream tests, as shown by the following facts:—

The separator should always be run at the speed directed by the manufacturer. It is better to turn at too high a rate than too low, for, in the latter case, the fat loss in the skim milk is increased in proportion to the decrease in the number of revolutions.

The milk must be allowed to enter the bowl freely during separation. The level is automatically controlled by the float, and if the flow is partly shut off, a higher testing cream will result. An over supply will result in a lower testing cream, and, more important still, excessive fat loss will occur.

Milk is at the best temperature to be separated as it comes from the cow, as it is less viscous than at lower temperatures, so runs easily through the separator, and more perfect separation of the fat results. At lower temperatures, due to the viscosity of the milk, separation becomes more difficult with greater fat losses. It is doubtful whether any machine will do good work if the milk is below 80 degrees Fahrenheit.

The quantity of skim milk or water used to flush the bowl usually varies considerably from day to day, and may cause a variation in the test of 2 to 5 per cent., depending on the quality of cream. Vibration of the separator causes the skim milk and cream to be shaken together, so that they do not find their way to their respective outlets. Fat losses are increased by the escape of fat globules through the skim milk outlet.

Other factors which influence fat losses are the cleansing of the separator and the condition of the milk, but these should not cause any difficulty where there is a proper appreciation of the necessity of hygienic methods.

There is a daily variation in the fat content of the mixed milk from the herd, and this is sometimes appreciable. This affects the test of the cream, but does not influence the quantity. For example, if a herd produced 100 lb. of milk with a fat test of 4 per cent., there would be 4 lb. of butterfat, while, if the fat were 5 per cent., 5 lb. of butterfat would be the result.

SELECTING A DAIRY HEIFER.

In the selection of a dairy heifer, the form and general character will, to a great extent, indicate whether she will develop into a good producer. When a heifer is quite young, the trained eye of the judge can see its dairy value and can discern the dairy type as distinct from the beef type. The production records of her ancestral dams on both sides are important factors in determining her future dairy value, while constitution is also important.

The form of the heifer with a future as a profitable producer is, in miniature, that of a good type, fully-developed dairy cow. Dairy

characteristics are indicated by an absence of surplus flesh; she is somewhat angular and spare. The head is typical of her breed, the eyes large and bright, and muzzle large, ears of average size, neck lean and lengthy, sloping with the shoulders. She is sharp over the shoulders, ribs well sprung, with good heart girth. The forequarters are light. Digestive capacity is indicated by the depth through the barrel from the centre of the back to the navel. Good depth indicates ample capacity to convert food into milk. The greater the depth through the middle, the greater the production is likely to be. The back is straight. There is a good length from the hip to the pin bones, and from the hip to the flank. The thighs are flat and free from fleshiness; the line of the thigh is incurving. The bones should be light and not coarse. The tail should be thin and free from flesh. All of these points should indicate that there is no tendency to lay on flesh.

The udder (as yet undeveloped), milk veins and wells are reliable indications of the heifer's future value as a dairy cow. The skin covering and surrounding the immature udder is soft and loose with teats well placed. The milk veins can be followed with the finger and milk wells gauged. Comparatively well-developed milk veins and large milk wells also are important points in judging a dairy heifer.

CREAM DELIVERY IN SUMMER.

Frequent and early delivery of cream to butter factories in summer is an important point in dairy practice. Daily delivery is not always possible in some districts, but nothing less than a four times a week delivery should be the rule from October to March, inclusive.

The holding up of supplies and delaying the cream carrier for the purpose of making certain that the morning's cream goes with the cream obtained previously should be avoided. The mixing of newly produced warm cream with older and cooler cream is not infrequently the cause of cream being graded down on delivery at the factory platform.

Dairy farmers would be well advised to have their cream ready for the cream carrier on each morning of delivery. Should the morning's cream not be cooled down and ready on time, that particular cream should be held back for the next delivery; and, if this is done, better factory results will be obtained.

It has been reported that some dairy farmers make a practice of holding up the cream carrier for the purpose abovementioned, and, even were this not detrimental to their own cream, it is somewhat selfish and unfair to neighbouring farmers who desire their cream to arrive at the factory as early as possible.

As summer has come, the attention of all dairymen is directed to the necessity of supplying cream with a butterfat content of not less than 38 per cent.

A sound summer slogan for all cream suppliers is: "Frequent and early delivery and test around forty!"

COST OF LOSSES IN SEPARATION.

Every dairyman knows that a loss of milk-fat in separating means loss of money, but many do not realise the full extent of the loss. There is a small amount of fat which is not recoverable by mechanical separation; so this loss is unavoidable. A loss of 0·08 per cent. is not excessive, but if it is higher, either the mechanism or the manipulation of the separator is at fault.

The table hereunder will give some idea of the position when the actual loss of fat exceeds the amount which is not recoverable by mechanical means.

Assuming that the average yield of milk is the modest amount of 1 lb. of commercial butter to 23 lb. of milk, the loss will be as follows:—

	Per cent.			Commercial Butter.
Loss of	0.08	is equal to	loss of	1 lb. in 50 lb.
”	0.09	”	”	1 lb. in 44 lb.
”	0.1	”	”	1 lb. in 40 lb.
”	0.2	”	”	1 lb. in 20 lb.
”	0.3	”	”	1 lb. in 13.3 lb.
”	0.4	”	”	1 lb. in 10 lb.
”	0.5	”	”	1 lb. in 8 lb.
”	0.6	”	”	1 lb. in 6.6 lb.
”	0.7	”	”	1 lb. in 5.7 lb.
”	0.8	”	”	1 lb. in 5 lb.
”	0.9	”	”	1 lb. in 4.4 lb.
”	1.0	”	”	1 lb. in 4 lb.

On the same basis of yield of butter from milk, a herd of cows producing 50 gallons of milk a day will produce in one year 187,062 lb. of milk yielding 7,482 lb. of commercial butter, which at 1s. per lb. is worth £374 2s.

A loss of ·1 per cent. would cause a loss of £9 7s., and a loss of 1 per cent. would be equivalent to a loss of £93 10s.

This example will serve to emphasise how necessary it is that a separator should be maintained in perfect order and be operated continually at its correct speed.

A HANDY MILK CAN CART.

Here is an illustration of a cart for easy handling of heavy milk cans. By simply tilting the handle, it picks up the cans easily. The drawing explains the

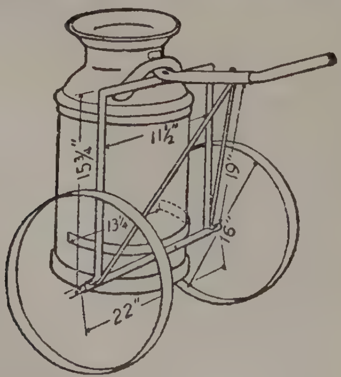


Plate 242.

dimensions. This device will accommodate 5-gallon cans just as easily as the larger ones.

Paddocks for Pigs.

FARMERS who have not already adopted the practice are advised to give careful consideration to the advantages of running pigs on the grazing system as compared with the intensive penning system which, until a few years ago, was the recognised practice of most pig keepers.

There is little doubt that the old custom of confining pigs to small pens resulted from the desire to produce very fat carcases. Present-day buyers demand leaner pork and bacon; so it is necessary to alter pig-raising practice accordingly, especially in respect of breeding, feeding, and penning. Provided pigs are bred to the correct type—that is, pigs intended for light porkers bred from quick-maturing stock, and pigs intended for baconers bred from later-maturing stock—they may be kept under grazing conditions from birth until fit for slaughter with very good results. Pigs kept in paddocks throughout their lives have a tendency to grow rather than fatten, and it is the lean, growing pig, and not the fat pig, which is required for meat.

When grazed, pigs find a lot of their food in the form of pasture or forage crops specially grown in the pig paddocks, and these foods usually require less labour and are cheaper than other pig foods. The pigs not only do their own harvesting, but also return a good amount of manurial matter to the soil, thus maintaining or improving soil fertility.

With the run of a good paddock containing some pasture or green crop, there is very little chance of pigs suffering from mineral or vitamin deficiency. This is a decided advantage over the intensive penning system, in which ill-health often results from a lack of knowledge or care in attempting to supply a complete diet. Penned pigs often suffer from dietetic disorders, and when turned out on pasture recover rapidly.

Under the intensive system, it is necessary to have buildings, floors, and drains well constructed in order to maintain a safe standard of hygiene. This also means extra labour and water for cleansing pens.

There is little, if any, difference in the costs of establishing a good paddock piggery and a good intensive piggery. One of the most important features of a paddock piggery is that the work of tending the pigs is much more congenial, for the only cleaning-up of the piggery consists of cultivating or resting the pig paddock and moving the sheds and troughs, which should be built on skids to allow of easy transport.

Probably the most practical method of controlling worm infestation in pigs is to run them in paddocks which can be cropped, fed off, and ploughed in rotation. This system and the use of moveable equipment is a very satisfactory method of pig raising under Queensland conditions.

ROUNDWORM IN PIGS.

Frequently, pig farmers ask for an explanation as to why their young pigs do not grow at a normal rate and do not reach bacon weight till, perhaps, about twelve months old. Some also state that losses among their young pigs have occurred at intervals over a number of years.

One of the chief causes of these troubles is a roundworm which is often found in large numbers in the small intestine. When a herd is infested the worms are frequently passed by the pigs, and, as they may measure up to 15 inches in length, are easily seen in the dung in the sties. The animals become infested through swallowing an egg which contains a very minute worm. These eggs hatch in the small intestine, and the small worms to which they give rise burrow into the intestinal wall and are carried by the blood stream into the liver and lungs. The young worms then leave the lungs and crawl up the windpipe into the mouth. They are then swallowed, and so reach the intestine once more, and this time they settle down and grow to maturity. The presence of the young worms in the liver and lungs causes serious disorders which may cause death, usually from pneumonia. If the animal survives, it remains stunted and sickly, and may have a short, hard cough.

This worm is, fortunately, in a way, harmful only to animals under about four or five months old, and in these young animals the effects of an infestation may be very prominent just after weaning.

The worms are easily removed with oil of chenopodium. Details of treatment with this drug may be had on application to the Animal Health Station, Yeerongpilly.

Treatment, however, should not be regarded as the only measure to be adopted for the control of this worm. Prevention of infestation is far more important, and this can only be ensured by strict attention to sanitation and other measures aimed at preventing the young pig picking up the worm eggs which are passed out in the dung. The regular removal of all manure, the maintenance of a high standard of sanitation in the sties and yards, and a paddock system of rearing go a long way to keep the infestation below the point at which it becomes harmful. Furthermore, the fact that pigs on a good balanced ration can fight more effectively against the evil effects of the worms than animals which are regarded as merely farm scavengers should not be overlooked.

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Adler, Tinana	Nevertire	White Leghorns, Australorps, Rhode Island Reds, and Langshans
F. J. Akers, Eight Mile Plains	Elmsdale	White Leghorns and Australorps
E. J. Blake, Rosewood	Sunnyville	White Leghorns, Australorps, White Wyandottes and Rhode Island Reds
R. H. & W. J. Bowles, North Rockhampton	Glenmore Poultry Farm and Hatchery	White Leghorns and Australorps
J. Cameron, Oxley Central	Cameron's	Australorps and White Leghorns
M. H. Campbell, Albany Creek, Aspley	Mahaca Poultry Farm and Hatchery	White Leghorns and Australorps
J. L. Carrick & Son, Manly road, Tingalpa	Craigard	White Leghorns
N. Cooper, Zillmere road, Zillmere	Graceville	White Leghorns
R. B. Corbett, Woombye	Labrena	White Leghorns and Australorps
T. G. Crawford, Stratford	Rho-Isled	Rhode Island Reds
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme	White Leghorns, Australorps, and Rhode Island Reds
Dixon Bros., Wondecla	Dixon Bros.	White Leghorns
Rev. E. Eckert, Head street, Laidley	Laidley	Australorps, White Leghorns, and Langshans
Elks & Sudlow, Beerwah	Woodlands	Australorps and White Leghorns
W. H. Gibson, Manly road, Tingalpa	Gibson's	White Leghorns and Australorps
Gisler Bros., Wynnum	Gisler Bros.	White Leghorns
G. Grice, Loch Lomond	Kiama	White Leghorns
J. W. Grice, Loch Lomond	Quarrington	White Leghorns
Mrs. M. Grillmeier, Mount View, Milman	Mountain View	Australorps, Minorcas, and Rhode Island Reds
C. & C. E. Gustafson, Tannymorel	Bellevue	Australorps, White Leghorns, and Rhode Island Reds
P. Haseman, Stanley terrace, Taringa	Black and White	Australorps and White Leghorns
C. Hodges, Kuraby	Kuraby	Anconas and White Leghorns
J McCulloch, Whites road, Manly	Hindes Stud Poultry Farm	White Leghorns, Australorps, and Brown Leghorns

Name and Address.	Name of Hatchery.	Breeds Kept.
A. Malvine, junr., The Gap, Ashgrove	Alva ..	White Leghorns and Australorps
H. L. Marshall, Kenmore ..	Stonehenge ..	White Leghorns and Australorps
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White Leghorns, and Langshans
J. A. Miller, Racecourse road, Charters Towers	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	Australorps, Brown Leghorns, and White Leghorns
Mrs. H. I. Mottram, Ibis avenue, Deagon	Kenwood Electric Hatcheries	White Leghorns
J. W. Moule, Kureen	Kureen ..	White Leghorns and Australorps
D. J. Murphy, Marmor ..	Ferndale ..	White Leghorns, Brown Leghorns, Australorps, Silver Campines, and Light Sussex
S. V. Norup, Beaudesert Road, Cooper's Plains	Norup's ..	White Leghorns and Australorps
H. W. & C. E. E. Olsen, Marmor	Squaredeal Poultry Farm	White Leghorns, Australorps, Black Leghorns, Brown Leghorns, and Anconas
A. C. Pearce, Marlborough ..	Marlborough Stud Poultry Farm	Australorps, Rhode Island Reds, Light Sussex, White Wyandottes, Langshans, Khaki Campbell and Indian Runner Ducks, and Bronze Turkeys
E. K. Pennefather, Oxley Central	..	Australorps and White Leghorns
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farm	White Leghorns, Australorps, Langshans, Rhode Island Reds, and Brown Leghorns
G. R. Rawson, Mains Road, Sunnybank	Rawson's ..	Australorps
J. Richards, Atherton	Mount View Poultry Farm	White Leghorns and Australorps
H. K. Roach, Wyandra	Lum Burra ..	White Leghorns and Australorps
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
A. Smith, Beerwah	Endcliffe ..	White Leghorns and Australorps
A. T. Smith, The Gap, Ashgrove	Smith's ..	White Leghorns and Australorps
T. Smith, Isis Junction	Fairview ..	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
A. J. Teitzel, West street, Aitkenville, Townsville	Teitzel's ..	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's Poultry Farm	White Leghorns and Australorps
W. A. Watson, Box 365, P.O., Cairns	Hillview ..	White Leghorns
G. A. C. Weaver, Herberton road, Atherton	Weaver's Stud Poultry Farm	Wyandottes, Indian Game, Barred Rocks, Australorps, White Leghorns, Anconas, Rhode Island Reds, Buff Orpingtons, Black Orpingtons, and Buff Leghorns.
T. Westerman, Handford road, Zillmere	Zillmere ..	Australorps and White Leghorns
H. M. Witty, Kuraby	..	White Leghorns and Australorps
P. A. Wright, Laidley ..	Chillowdeane ..	Brown Leghorns, White Leghorns and Australorps
R. H. Young, Box 18, P.O., Babinda	Reg. Young's ..	White Leghorns, Brown Leghorns and Australorps

FEEDING COSTS IN THE FOWLYARD.

Every effort should be made to keep production costs down to a minimum. On many farms this is being done, but on many more feeding costs are excessive.

The actual costs of foodstuffs is governed by supply and demand; therefore no material saving can be made at this point. Any change in the present ration fed is of doubtful value, because such a change may result in lowering the egg yield. Again, it is doubtful whether any substitute for the existing rations would be economical.

This only leaves the actual practice or management of feeding open to question. Summed up, the cost of production is governed to a great extent by the food consumed and the wastage. Any reduction in food consumption is followed by a reduction in egg production; therefore feeding costs cannot be reduced by feeding less food.

Food wastage is an appreciable factor in feeding costs. This applies irrespective of the actual cost of foodstuffs, to dry mash, wet mash, and grain feeding. By far the greatest wastage occurs in the dry-mash system of feeding. This fact has been pointed out to many farmers, who have immediately remedied the fault. Faultily constructed hoppers are the cause of nearly all the wastage that occurs with the dry-mash system.

There are many different designs of dry-mash hoppers, and a plan of a suitable hopper can be obtained free on application to the Department of Agriculture and Stock, William street, Brisbane. This hopper has other important features besides economy. The most important part of any feed hopper is the feeding trough, which should provide ample space for the birds to eat, at the same time preventing any waste.

The hopper recommended embraces these features within certain limits. It also permits the mash to fall freely. It must be understood, however, that some mashes will run or feed more freely than others. Therefore, no one hopper will prevent different grades of mash overfilling the trough and allowing the mash to be easily scratched out. The hopper referred to has a lath along the front of the trough, and if the mash runs too freely and if wastage occurs, this lath can be shifted to reduce the space. This hopper is easily and cheaply constructed.

Recently one poultry farmer installed several of this class of hopper, and he stated that, although production was maintained at the same level, the hoppers brought about a saving in food costs of approximately £4 per week. Some time ago another farmer installed similar hoppers and reduced feeding costs from five bags to three bags of laying mash each week. These two illustrations should be sufficient to demonstrate that wastage can be prevented. In the latter instance, the farmer was confident that there had been no wastage of food on his farm.

To find out if wastage is occurring, a rough estimate may be obtained by looking up the purchases of foodstuffs for the previous month or a longer period. As the birds consume approximately equal quantities of mash and grain, the quantities (by weight) purchased should be approximately the same. If the quantity of ingredients for a mash exceeds the quantity of grain purchased, it indicates that the excess quantity is being wasted.

A more accurate method is to count the number of birds in one shed, then empty the hopper, refill it, and record the weight of mash supplied; the period which the mash lasts will indicate the true position, as each bird will consume on an average 2 oz. of mash daily. For example, 100 birds supplied with 100 lb. of mash will consume it in eight days; if it lasts only six days each bird is wasting 4 oz. weekly; if it lasts seven days there is a wastage of 2 oz. per bird weekly. Such a small wastage is outlined—of 2 oz. per bird weekly—does not appear to be of great importance, but with a flock of 1,000 birds this would amount to 6,500 lb. in a year and would cost about £35, based on present feeding costs.

By putting into practice the advice offered, wastage will be minimised and the margin of profit increased.

BLACK COMB DISEASE IN FOWLS.

Black comb disease in poultry occurs frequently throughout the State from October to March. It usually affects laying hens, and is responsible for heavy losses to the industry either by death or decreased egg production.

Where treatment is prompt the mortality does not appear to be as extensive as when treatment has been delayed. Again, early treatment appears to assist in getting affected birds back into production much more quickly than when it has been deferred.

The first indication of the disorder is a bird's pronounced loss of appetite, followed in the course of a few hours by a darkening of the comb. In fact, it is not uncommon for 25 per cent. of the flock to have a very darkened comb within twenty-four hours of the first sign of the trouble.

In the early stages of this disease the temperature of sick birds rises. This induces thirst. As the disease develops, little desire for water is in evidence, and as treatment for this trouble is given by means of the drinking water, the necessity for prompt action is obvious.

On further examination of the sick birds, it will be found in most cases that the crop is full—an indication of the suddenness of the attack. This condition of the crop has caused many breeders to attribute the trouble to the food and water. As the disorder advances, the legs of the Leghorns particularly, become very much darkened in colour; and if the feathers of a bird of any breed are turned back, the skin will be found to be darker than usual. Diarrhœa has been observed in some cases, but it is not apparent in all affected flocks.

The mortality from this disorder appears to be governed largely by the general condition of the flock and the rapidity with which treatment is applied. Where prompt measures have not been taken, losses have been as high as 20 per cent.; but where early treatment is given deaths have been as low as 1 or 2 per cent. The loss from deaths, however, is not the only important factor. Egg production has been observed to fall from 60 to 5 per cent. within six or seven days.

Treatment.—Several proprietary mixtures are used with apparently beneficial results, but, in perference to deferring treatment until these mixtures are procurable, the breeder is recommended to administer Epsom salts to the birds in the drinking water at the rate of 1½ to 2 oz. to the gallon.

SOME POINTS IN POULTRY MANAGEMENT.

In poultry farming, culling serves two important purposes. By getting rid of the culls, all of the feed goes to the laying hens; and only the best hens remain in the flock to serve as future breeding stock.

Other sound points in poultry farming include care in the handling and marketing of eggs. Eggs are considered to be one of the best of foods, yet in spite of that fact the quantity consumed by Queenslanders (estimated on an annual *per capita* basis) is extraordinarily low. Why more eggs are not eaten is probably because their regular dietary value is not more widely appreciated. There are other reasons, too; for instance, the delivery of dirty-shelled eggs and the production of fertile eggs in hot weather. Clean nests, clean floors, and clean containers will soon overcome the dirt difficulty; while selling off all the male birds at the close of the hatching season is the answer to the other problem. Eggs should be gathered two or three times daily, and marketed at least twice weekly in hot weather.

In looking after poultry, even with the best of care, we often overlook a very common source of trouble, and that is the house fly. Flies can go a long distance and carry germs and contamination from a diseased flock, or from microbe-infested filth. The industrious pullet will chase and catch flies just for the fun of it, and, at the same time, take in all sorts of germs or worms. So it would be wise to clean up every attraction for flies and spray the fowl-houses just before cleaning them out. For general health reasons, apart from the requirements of the fowl run, it pays handsomely to swat the fly.

PROTECT EGGS FROM MOULD.

Under humid summer conditions, eggs are more prone to decomposition than at cooler periods of the year. This is not because of the effect of the climate on the egg itself, but because of the rapidity with which mould growths develop during warm weather. If it were practicable to prevent the egg coming in contact with moulds, decomposition of the egg from this cause would not occur.

If fowlyards are allowed to become littered with straw, dry grass, and similar material, mould spores will develop abundantly. Consequently, the poultry farmer is advised to clear away all rubbish, and do all that he can to prevent the development of moulds.

Dampness in any degree is conducive to the rapid growth of moulds; consequently, every precaution should be taken to ensure that the nesting material is dry and clean, and that the eggs and fillers used for packing them are dry.

Two recent examples of how easily the quality of eggs may be depreciated are cited:—In one case it was found necessary, because of a muddy poultry run, to wash every egg. The washing was well done, stains were removed with an odourless sandsoap, and the eggs were clean when packed; but, unfortunately, they were packed in strawboard fillers, with a slight bead of moisture on the shell. In the course of two days, when these eggs had reached the market, quite a number of rots had developed. As the poultry farmer concerned had a reputation for

marketing good eggs, the agent retained the eggs that were apparently good on arrival for a further two days, but, on testing, many more rots were found.

The second case was that of a farmer who had well-grassed runs for his fowls. Although nests were provided, many of the hens nested in the grass. Complaints as to the quality of the eggs were received by the agent to whom these eggs had been consigned, with the result that the next consignment to reach the floors was carefully candled. Candling disclosed a number of rots. Eggs which were in apparently good condition were retained on the floors for another two days and again candled, when more rots were revealed. This led to an investigation by the Department of Agriculture and Stock, when it was found that only the eggs that had been laid in the grass were affected, and that the rottenness was caused by mould growths which had gained access through the pores of the shell. Providing the hens with more clean nests and so discouraging them from laying in the grass corrected the trouble.

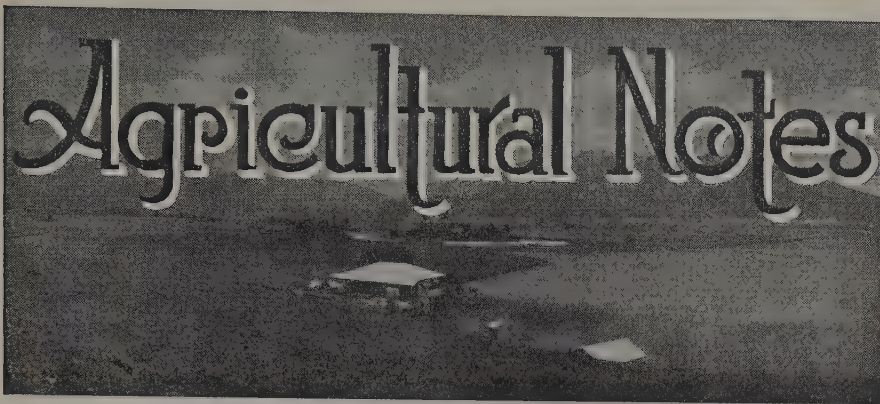
These examples indicate how easily the quality of eggs can be affected, and that it is essential—particularly during hot, humid weather—to protect eggs from decomposition caused by moulds.

SIZE OF EGGS.

Although the internal quality of the egg is of primary importance in determining price, the factor of size cannot be overlooked. Eggs are usually graded for sale according to size; but those averaging 24 oz. to the dozen are in greatest demand, not only in Queensland, but in the markets to which our surplus production is consigned.

In these circumstances, every poultry raiser should strive to produce eggs that meet the requirements of the market. To do this, it is necesary to select breeders that will reproduce progeny capable of laying the maximum number of eggs closely approaching 2 oz. in weight. Most poultry keepers when selecting their breeders know very little about the early performance of their stock in respect of size of egg—particularly the size of egg that a hen laid during her first year of production. As a breed is more prolific during the first laying year, it is then that the egg size is of particular importance.

All pullets when commencing to lay produce an egg very much undersized. Some birds take a considerable time before their eggs reach the most desirable commercial size and others, again, may take only a week or two. As it is an inherited factor, egg size is one of the chief points to be considered in selecting future breeders. Many pullets—the breeding stock of the future—will be coming into production within the next month or so, and it is suggested that poultry breeders who are not entirely satisfied with the size of egg from their flocks should take the opportunity of selecting and marking pullets that commence to lay eggs of a 2-oz. standard early in life. Many of these birds may have to be rejected for some purpose or other, consequently the number selected should be large enough to allow for a reasonable percentage of rejections.



Kikuyu Grass—A Good Pasture but a Bad Weed.

INTRODUCED from East Africa some years ago, Kikuyu grass has gained favour with dairy farmers, although many old-established stands now seem to be declining in productivity.

Kikuyu grass is a perennial which spreads rapidly over and through the ground by means of running stems. Both the surface and underground runners root freely at the nodes, anchoring the plant firmly in the ground and forming a dense turf which stands heavy trampling by stock. The stems carry a large quantity of leaf, and the stems also are very succulent. Under good conditions, Kikuyu grass makes a very good dense growth, often 2 feet or more in height.

In Queensland the grass has adapted itself fairly well to different districts. It does best under warm, moist conditions, but will withstand a considerable degree of cold and keep green in spite of fairly severe frosts. For this reason it is very valuable for late autumn and early winter feed. Its drought resistance is fairly good, and some success with the grass is reported from the Burnett and Darling Downs.

Kikuyu grass spreads most quickly and yields most heavily on loose, rich soils; and while it may provide fair grazing on some less fertile soils of a sandy or clayey nature, it is advisable to restrict plantings to rather productive soils, unless in special circumstances—such as when a grass is required for rough places or as a soil binder to prevent erosion. Kikuyu grass makes a heavy drain on the soil, and periodical ploughing or severe cultivation is necessary to improve the soil conditions.

In Australia, Kikuyu grass sets seed very rarely, and commercial supplies are not available. It is necessary to establish the grass by planting pieces of the runners.

In addition to its value as a pasture grass, Kikuyu grass has some value for bracken control. If planted out in bracken, Kikuyu attracts stock, which trample down the fern while feeding on the grass.

Although a very valuable grass in its place, Kikuyu grass may become a troublesome weed if it is permitted to encroach on ploughed land. For this reason, it should not be planted near areas likely to be required for cultivation. In wet weather portions of the grass are often broken off by grazing animals, and these pieces may be carried on the hooves to other portions of the farm, and become established after tramping in. Patches started in this way on land required for cultivation should be dug out immediately.

LUCERNE HAY.

Baled lucerne hay, or lucerne chaff, and maize grain are now recognised as the basis of all supplementary or drought feeding, if the fodder has to be transported over long distances. Increased attention is, therefore, being given to the production of good quality lucerne hay. Good hay containing 45 per cent. to 50 per cent. of leaf will always command a good price, while a weathered or sweated consignment will be hard to sell.

Very careful handling is required from the time lucerne is cut until it is stacked or baled for market. Prime lucerne hay should be green in colour, dry, free from weeds or rubbish, and should contain a high proportion of leaf. Prevailing climatic conditions are naturally an important factor, and, whenever possible, cutting should commence in bright, fine weather. Lucerne should be cut shortly after the first flowers have appeared, when numerous young shoots will usually be observed at the base of the crowns. When the plants are allowed to become over mature, actual loss of weight and feeding value occur, as leaf will be lost, and the stems will harden, thereby becoming largely indigestible. It is customary to commence mowing in the morning as early as possible, after any heavy dew has evaporated. During fine, hot weather, raking may commence about midday. Raking into windrows should, if practicable, be completed by nightfall, as much leaf may be lost if the lucerne is left too long in the swath. After wilting for a few hours in the windrows, fork into high narrow cocks which encourage the natural transpiration of moisture better than if broad flat cocks are made. If rain occurs the lucerne will require turning to prevent the formation of mould, but during fine, hot weather it is possible to stack within two days of cutting. Excess moisture will induce mould, and possibly combustion in the stack, while if the lucerne is allowed to become too dry, it will lose appreciatively in palatability, weight, and appearance. Before carting, the stems should be tested by twisting them between the hands, when any excess moisture will become evident.

Wherever possible, lucerne hay should be stored in shed, but if it becomes necessary to stack it in the field, a framework of logs should be laid down, care being taken to keep the centre of the stack high during building. Large stacks which are likely to be held for some years may be protected by thatching or by a temporary galvanised-iron roof.

Proximity and accessibility to the chief markets is obviously an important factor in the profitable production of lucerne hay for direct sale.

SEEDS OF NATIVE GRASSES.

Within recent years a considerable amount of interest has been shown both by pastoralists and by dairymen in the sowing-down of pastures of drought-resistant native grasses. Many of the graziers who have sought information concerning the availability of native grass seeds have desired to utilise the seed for the artificial reseeding of natural pastures which have been thinned out by drought. Numerous other sheep and cattle-raisers have been eager to sow down, on their own properties, drought-resistant native grasses from other parts of the State. The heavy losses sustained in many dairying districts during the recent drought stimulated a desire in many dairy farmers to test out the most renowned of the native pasture grasses under their local conditions.

The grasses in most demand for the purposes outlined above are the Mitchell grasses. There are four distinct types of Mitchell grasses (Curly Mitchell, Hoop Mitchell, Barley Mitchell, and Bull Mitchell), and of these, perhaps, the best one for general purposes is the Curly Mitchell.

Seed of Curly Mitchell is now being collected in large quantities for commercial purposes. If sown broadcast about 4 lb. an acre should suffice to give a good stand; and this quantity may be reduced by half if the seed is sown in drills with a combine.

In some circumstances, one or more of the other three types of Mitchell grasses are to be preferred to the Curly Mitchell, but so far as can be ascertained no seeds of these types are yet available.

While the purchaser of Mitchell grass seed has at present little choice in the matter of the origin of the seed (practically all of the seed being harvested in northern New South Wales), he should bear in mind that seed collected in his own district or in a district with similar climatic conditions is likely to be better for local sowing than seed from other sources.

Seed of Australian blue grass has been on the market for many years. This, also, is harvested in New South Wales, and, consequently, may not be as valuable as locally collected seed for sowing in Queensland.

GOOD SEEDS.

Although nearly everyone will agree that better seeds mean better crops, it must not be overlooked that better cultivation means better seeds.

Seeds to be good must have a high germinating capacity, be true to variety name, and free from weed seeds, inert matter, and disease or insect infestation. No matter how careful the grower may be, all crops will contain some plants other than those which it is intended to produce. A cleaning machine should, therefore, be used before the seed is offered for sale. In Queensland, as in every other part of the world, the most critical buyers will be found among the merchants with efficient cleaning machinery.

A modern seed-cleaning plant can make good samples of uncleaned seeds better, but it cannot make bad samples good. With a full knowledge of their machinery possibilities, most merchants are willing to

buy on a clean seed basis. They are not, however, inclined to purchase poor samples, and the usual market for seeds of indifferent quality is with dealers who have little appreciation of impurities. The actual seed-user who insists on buying his supply on a price rather than on a quality basis encourages the vendors of goods of inferior quality. Unfortunately, seeds of indifferent quality usually carry a large profit to the seller.

Good seeds cost money to produce and money to clean, and the general improvement of farm seeds rests largely with the farmers themselves. When practically every farmer insists on a high-grade product the demand for poor-quality seeds will cease. Only the best-quality seeds are worth buying.

WHY BIRDS SHOULD BE PROTECTED.

At this time of the year, when birds are nesting, an earnest appeal is made to all to become interested actively in the preservation of wild bird life. The value of birds in our rural economy is incalculable. It has been well said that the service that birds render in protecting forest trees "is more nearly indispensable to man than any other benefit they confer on him. Were the natural enemies of forest insects annihilated, every tree would be threatened with destruction, and man would be powerless to prevent the calamity. He might make shift to save some orchard or shade trees; he might find means to raise some garden crops; but the protection of all the trees would be beyond his powers. Yet this herculean task ordinarily is accomplished as a matter of course by birds and other insectivorous creatures without trouble or expense to man."

During recent grasshopper visitations, many thousands of starlings were to be seen feeding on the insects, but starlings were not alone in their assault on the common enemy. Every insectivorous bird fed to fullness on the hoppers. The indiscriminate shooting of bush birds has, therefore, nothing to commend it from any point of view.

Fortunately, very few native birds are not protected legally, but even the despised crow is a friendly ally in the continuous war against insect pests. Crows eat grasshoppers, and it takes a lot of hoppers to fill the craw of a crow. The crow also is an energetic scavenger. It eats carrion and maggots. From maggots come blowflies, and the loss to Australian woolgrowers caused by blowfly infestation runs into milllions of pounds annually.

THE PRESERVATION OF CONCRETE.

Concrete floors and troughs often show signs of wear soon after being laid down, a fault which is generally caused by the action of acids in milk and other pig foods. Unless properly surfaced, concrete becomes pitted, and may eventually break up. This deterioration may be prevented, or, at least, delayed by the right use of a special type of silicate of soda, which is cheap and easy to apply. "Quartzite" is its trade name, and when it is mixed with water the solution thus obtained is sprinkled on the surface of the concrete. It is soon absorbed, and, combining with the concrete, forms a tough coating which is resistant to water and acids under ordinary farm conditions.

To prepare the solution for use, one gallon of "Quartzite" silicate of soda is thoroughly mixed with four gallons of water. The five gallons of solution will be enough for three applications to an area of 300 square feet of concrete. Very dry or porous concrete will require a fourth application.

When making new concrete floors, the surface should not be finished off very smoothly, as stock will have difficulty in standing on it when it is wet. When the concrete is firm and almost dry, the solution of silicate of soda is applied with a spray pump, a watering can with a fine sprinkler, or a mop. The solution should not be flooded on; just as much as the concrete can quickly absorb is all that is required. A second, and later, a third application of the solution should be made as the surface dries out each time. For new concrete, three applications should be sufficient.

If so desired, the "Quartzite" may be added directly to the concrete when being mixed, at the rate of one-fifth of a pint of full strength for every bag of cement used. The "Quartzite" is added to the water used for mixing the cement. Care should be taken to ensure that the correct quantity is used, as too much "Quartzite" may make the mix sticky, and set too quickly.

When the first set of the concrete is complete, coat the surface with a solution of the "Quartzite" in the proportion of one part in four of water.

Worn floors and troughs may be renovated in the following way:—"The surface should first be scrubbed thoroughly with soap and hot water to remove grease and dirt. The cleaned surface should then be painted with the undiluted "Quartzite" and dusted while still wet with dry cement powder. This sets in a few minutes and provides a surface to which the layer of new concrete binds firmly. This layer consists of one part of cement to three parts of clean fine sand. When firm and drying, treat with the silicate of soda solution as suggested for new concrete.

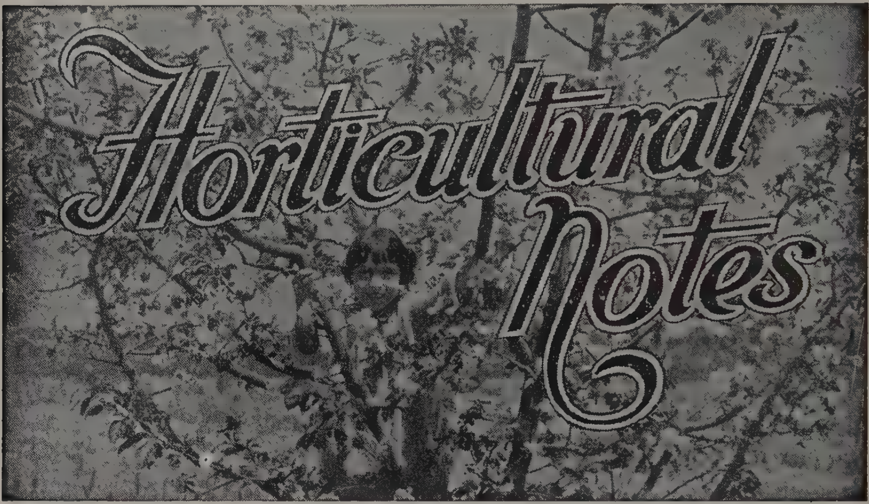
Sound floors and troughs also will benefit by treatment with silicate of soda. The surface should be freed from grease as beforementioned. Four applications of solution will probably be necessary, and twenty-four hours after the last application any solution remaining should be removed from the surface.

Concrete floors and troughs treated in this way last longer, are easier to clean, and dry more quickly than untreated concrete. For best results, the concrete should afterwards receive a light treatment once a year.

When ordering silicate of soda for conditioning concrete, the purpose for which it is required should be stated, to ensure obtaining the right material.

A REGRASSING EXPERIMENT.

On a stock reserve at Condobolin, New South Wales, no vegetation had grown for many years. The surface soil had blown away and only scalded clay remained. As a result of reclamation work by the local pastures protection board and the Soil Conservation Service, the plain is now carrying a fair cover of herbage. A crop of oats, grown without fertilizer, was not grazed or harvested, but allowed to remain to protect the surface and re-seed. Other seeds of grass and herbage blown across the reserve by the wind were caught and fixed, and it now seems that permanent vegetation will be restored on what was quite a barren area. Other experiments were tried, but this one is reported to have been the most successful.



Marketing Bananas.

DURING hot weather, bananas which have been cut and left exposed to the sun for only a short period soon become quite unfit for sale, and the pulp is eventually reduced to a soft, ''boiled'' condition. Cutting should be done in the early morning, before the heat becomes severe, and care should be taken to keep the fruit covered completely, even from the early morning sun, while waiting to be carried or wired to the packing-shed.

The fruit should at all times be handled with the greatest care—in fact, the less it is handled the better—and for this reason it is wise to have the packing-shed right in the plantation, if possible. On cutting the bunch it should not be laid carelessly at the foot of the stem, which usually means it rests on a bed of sticks and dead weeds. A bed of leaves is easily and quickly formed if the bunch must be set down in the plantation, although a better plan is to carry it straight into the shed or to the end of the wire and there place it upright on bags or trash with the stalk leaning against a rail provided for the purpose. In this way, possible damage will be reduced to a minimum.

On being dehanded, the fruit should be allowed to ''drain'' for a few hours. Packing immediately after dehanding sweats the fruit in the case and makes bruising much easier. Care should be taken to ensure that fruit which is ''sprung'' or in the early stages of ripening is not packed, as it will quickly be reduced to pulp and be unsightly in a case of otherwise sound bananas. No fruit should be packed for southern markets from bunches in which some of the fingers are already showing colour indicating ripening. The fruit should be dehanded just at the collar joining the fingers to the main stalk. The most suitable knife for this work is one of a sharp, flexible, and very narrow type.

There is a right and wrong way to separate the hands into singles, if a ''single'' pack is desired. Tearing the bananas apart endways often peels part of the skin from the fruit and also bruises the stem,

thus setting up an entrance for organisms which cause blackend. The correct method of separating into singles is to grasp the cluster firmly with both hands at the stem end, then twisting one hand forwards and the other backwards, the fruit is separated easily and without any damage to the stalk end.

On completion of packing the cases should be packed on their sides in a cool, shady position to await transport to rail or market.

Should it be desired to use the "cluster" pack, the same method should be adopted, separating three or four instead of the single finger. If a cluster of three or five is used, a single banana should be added to make it a four or six. The secret of clusters is to have the fruit in twos.

THE CHOKO.

The choko is a popular vegetable, grown largely in Queensland for both market and home use. It has the advantage that, once planted, it comes into bearing each year from the original root. The plant will die down only during the coldest months, and in the spring will shoot again from the tuber which is formed under the ground.

The choko requires a rich loamy soil to which has been added a heavy dressing of well-rotted stable manure. Additions of dried blood and bone dust, or of manure during growth, are of great benefit, as, being a perennial and a heavy feeder, the choko's food requirements are considerable.

The method of planting the choko differs greatly from that used for other varieties of the same family. Whole choko fruits are used as planting material, the growth coming from the shoot from the kernel in the fruit. The fruit should be planted on the side with the broad end sloping downwards and the stem end slightly exposed.

A trellis is essential to satisfactory growth, although, if planted near a fence or old stump, the plants will spread over it very quickly. When chokos are grown commercially, it pays to erect a suitable trellis. This may be done with logs or rough timber. Sometimes an ordinary "T" trellis is used, over which strong fencing wire is stretched.

A good permanent trellis may be constructed as follows:—Two rows of strong posts are set firmly in the ground with a height of about 6 feet 6 inches above the surface, the rows being about 9 feet apart and the posts about 8 feet apart in the rows. The tops of the posts support cross timbers on which fencing wire is stretched with about 18 inches between the wires to carry the vines. Stays support the outside posts, and wires for trellising also should be stretched on these.

The choko takes some months to come into full bearing, but will commence to bear fruit generally about four to five months after planting. The plants seem to improve with age when properly cultivated and manured.

There are two varieties, the green and the cream. The cream-coloured variety is the more popular.

Chokos should be picked fresh and, after having been pealed, should be cut into suitable portions and boiled or baked.

BANANA CULTIVATION.

In normal seasons there is no tool so useful as a strongly-made four-pronged forked hoe with prongs about 7 inches long and a fairly short handle. With such a tool it is possible to cultivate hillside land to a depth of 6 or 7 inches and to easily bury the dead trash by the same operation. The waste stalks can be placed sideways across the hill and the soil turned in against them, thus hastening their decomposition. The method of using a forked hoe is to drive it into the ground with a good easy swing, then canting the handle slightly and at the same time pulling towards the user. This action turns the top soil under and leaves the surface somewhat roughened. Good cultivation at least twice each year should be the objective. It keeps the plants well down in the soil, and with a good short-handled forked hoe it is surprising how great an area can be covered in a day.

A long-handled light hoe is awkward to manipulate, and is of little use to a banana-grower farming under ordinary conditions.

The oft-explained method of desuckering, in certain seasonal circumstances, always gives beneficial results. Some soils are only capable of carrying one bunch and one following sucker at the one time; others are capable of carrying up to three bunches to the stool with suckers placed correctly to produce the second crop. When the unwanted sucker has been cut off at ground level and gouged out, it is an excellent plan to throw a couple of handfuls of soil into the newly made hole, thereby stopping the "bleeding" effect so noticeable, an effect which is very definitely harmful in dry weather. The plantation should always be trashed before desuckering, and, in ordinary seasons, by making the digging operations the last of the necessary trio most of the waste vegetative matter lying on the surface will be worked into the soil, to, in due course, enrich the land by building up humus, a substance so necessary in all forms of agriculture.

LADY FINGER BANANAS—CULTURAL METHODS.

The fruit of the Lady Finger variety of banana has a very pleasant flavour, its keeping qualities are good, and it is always in demand.

Alluvial flats with a subsoil of free clay suit the variety best, but it can be grown succesfully on hillsides of even contour where the rainfall is copious and regular, and where shelter is provided from heavy winds.

Thorough preparation of the soil is necessary, and, where possible, it should be worked to a depth of at least 12 inches. Healthy butts, at least nine months old, with a minimum diameter of 6 inches, are the best planting material. On the loamy flats, the distance apart should be 18 feet by 16 feet, with three followers; on hillsides and other less favoured sites, 15 feet by 15 feet, with two followers.

To prepare for planting with two followers, the butt should have about 2 feet of the pseudo stem left and all visible eyes or buds gouged out with the exception of two, which should be on opposite sides. The same method is adopted for three followers, except that three buds are left spaced equally round the butt.

Two, or, as the case may be, three suckers will appear in a short time after planting and trees are allowed to grow, but all other growth must, for at least nine months, be removed as soon as convenient after it appears above the soil. After the selected suckers have made two-thirds of their growth towards maturity, giving them a height of approximately 8 feet, a follower can, under favourable conditions, be selected on each plant in a straight line away from the parent plant and left to form the fruiting material for the second crop. The growth habit by which successive suckers may be selected in a straight line away from the original plant will persist for the life of the plantation, and all other growths should be removed as soon as possible. By careful attention to this and other cultural methods, maximum returns can be expected and realised.

Periodical applications of fertilizer, when the soil is of average fertility, will have beneficial results.

Cultivation should be shallow to avoid destroying the root system.

The planting of Mauritius beans down the centre of each row at a distance of 30 inches between plants would ensure a good mulch during hot summer weather and considerably retard weed growth.

Covering of the fruit with a suitable material, as advocated for Cavendish and Mons Marie varieties, during their maturing periods amply repays the grower.

HUMUS IN THE CITRUS ORCHARD.

Humus is an organic compound formed by the decay of vegetable matter in the soil, and is of great value in the citrus orchard.

Comparatively small amounts of humus are present in hot, dry localities on account of the higher temperatures. In such areas the humus is burnt out of the soil rapidly and does not accumulate to the same extent as it does in a moist or cool climate. Humus possesses the power of retaining moisture in the soil, whilst other advantages are that it makes heavy soils more porous, and sandy soils more cohesive.

It is possible to maintain a high humus content in the soil by annually working in vegetable matter—such as stable manure, green cover crops, leaves, and weeds—for these, if used, supply decaying vegetable matter to the soil.

When the humus content is low, sandy soils lose water quickly, and heavy soils become hard and baked after heavy rains. Under such conditions trees make poor growth, and the tops of the trees become thin. Small fruit may be formed, and it is subject to sunburn and splitting.

It is, unfortunately, difficult to obtain anything like adequate supplies of stable manure or similar material of a humus-forming nature, and, in order to make up the deficiency, the growing of green manure crops between the trees at times to correspond with the rainy season is recommended. Growing cover crops during dry periods is not desirable, because trees must not be deprived of the available soil moisture at such times. Under average conditions, green crops should be planted in citrus orchards about February and may be turned under about June.

TOMATO MARKETING.

A heavy spring crop of tomatoes in Southern Queensland districts is in prospect. A comparison of prices during the past season places the Southern Queensland output in a secondary position. There is strong reason to believe that this is influenced by (1) poor maturity of fruit, and (2) faulty packing. Another comparison shows that coloured fruit brings much better prices than green fruit. The question naturally arises as to why green fruit should be delivered when a higher price is obtainable for coloured grades.

No difficulty in marketing coloured fruit should occur until late in the season. By that time supplies will have begun to ease off, enabling extra care to be taken. Growers may achieve a desirable maturity standard by picking only matured fruit, and packing to a colour standard, any green fruit being left in a cool place until fit for a later consignment.

Difficulties may be experienced on large plantations, but these may be largely overcome by appointing one of the workers as a special packer. Having everybody on the farm doing all sorts of work does not make any man an expert in any particular job. A specialist in any type of work becomes fast and expert, always doing better work than the jack of all trades.

In furthering the aim of better packing, free tuition is available to growers from the Department of Agriculture and Stock by applying to the Under Secretary.

THE AFTER CARE OF GRAFTS.

Any deciduous fruit trees which have been grafted this season should be examined from time to time, and when the growth is about 8 inches long the wax cloth and string should be cut through with a sharp knife to allow for expansion; otherwise the string will cut into the bark and ruin the graft. Many grafts are ruined each year because of growers omiting to do this necessary work.

When cutting, first cut through the wax cloth and string only; do not remove the wax cloth. The scion will push it off, and until then it serves a very useful purpose in protecting the cut surface of the limb from the sun and spores of fungus diseases.

Many fungus diseases are what might be called wound parasites, and an unprotected cut surface is an easy place of entry for them.

Do not allow shoot growth from the stock to overcrowd or rob the scions, and when checking any such growth, note whether any grafts have failed; if so, thin out the shoot growth so as to allow two or three shoots to develop sufficiently and in the right place, so that they can be budded to take the place of the dead graft.

The best time for the budding of these shoots will be from the end of January to the middle of February. The shoots to be budded must be making growth, or else there will be no sap flow to form the union.

The buds should also be taken from the current season's growth, and from shoots that are still making growth. The buds should be cut from about the centre of the shoot, as they will prove more satisfactory than those taken from near the base or tip.

The Fruit Market.

J. H. GREGORY, Instructor in Fruit Packing.

OCTOBER was a month in which fruit supplies were in the doldrums. Many varieties of fruit reached the end of their season, and the new season fruit was only starting to arrive. Some small consignments of early stone fruits came on to the markets, and regular lines of mangoes were received.

The usual seasonal warning against marketing immature fruit is given to growers. The present tomato crop has illustrated the necessity for care in this connection. The season opened with prices at a level of 15s. and prospects of the maintenance of high values, but growers, through sending immature fruit, reduced values in a few days to below 8s. a case.

Green pineapples still form the basis of complaint on Southern markets. It is hard to understand why growers have to be continually advised not to pack immature fruit.

Prices for good quality bananas remain at satisfactory levels. Many consignments show the effects of the cold, dry period we have just passed through, the fruit being of a thin, angular type.

Mangoes are now arriving in increasing quantities. Northern growers will do well, but should not use a stick to remove the fruit from the trees. Many cases contain bruised and damaged fruit.

Passion fruit prices remain firm.

Apples are now deteriorating in quality, and Southern growers would be well advised to carefully select hard varieties and smaller sizes for this period of the year. Very soon the competition with stone fruits will be keenly felt.

Growers are reminded again that the age-old basis of marketing still pays best:—

"Quality fruit, packed well and handled carefully."

The following were the ruling market prices during the last week of the month of November, 1939:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Small, 5s. to 9s.; sixes, 10s. to 12s. 3d.; sevens, 12s. to 14s.; eights, 9s. to 14s.; nines, to 15s.

Sydney.—Cavendish: Sixes, 8 to 13s.; sevens, 13s. to 15s.; eights and nines, 15s. to 18s.

Melbourne.—Cavendish: Sixes, 12s. to 14s.; sevens, 14s. to 16s.; eights and nines, 16s. to 18s.

Adelaide.—Cavendish: 18s. to 24s. per case.

Lady's Finger.—1½d. to 6½d. per dozen.

Pineapples.

Brisbane.—Smoothleaf: 1s. to 6s. per dozen; 4s. to 7s. per case. Ripley: 1s. 6d. to 3s. per dozen; 7s. to 9s. per case.

Sydney.—Smoothleaf: 6s. to 8s. per case.

Melbourne.—Smoothleaf: 8s. to 10s. per case.

Adelaide.—Smoothleaf: 10s. to 14s. per case.

Papaws.

Brisbane.—Yarwun, 5s. to 8s. tropical case; Gunalda, 4s. to 6s. bushel; Locals, 3s. to 5s. bushel.

Sydney.—7s. to 10s. tropical case.

Melbourne.—8s. to 12s. tropical case.

Special quality higher.

Mangoes.

Brisbane.—8s. to 10s. bushel.

The season for sending mangoes to southern markets is now approaching. Intending exporters must remember that only high-class varieties are saleable on the Melbourne and Sydney markets.

Avocados.

Brisbane.—Good quality fruit is selling at 6d. each, supplies now being short.

Passion Fruit.

Brisbane.—First Grade, 12s. to 17s.; Seconds, 8s. to 12s.

Sydney.—8s. to 19s. per half bushel.

Melbourne.—8s. to 18s. per half bushel.

CITRUS FRUITS.

Oranges.

Brisbane.—9s. to 13s. 6d. per case; Second crop fruit, 5s. to 7s. Imported packing shed brands, 11s. to 13s.

Lemons.

Brisbane.—Locals, 6s. to 12s. Special brands higher. Victorian, 13s. to 15s.

DECIDUOUS FRUITS.

Apples.

Brisbane.—Democrat, 10s. to 15s.; Granny Smith, 10s. to 17s.; Sturmer, 10s. to 13s.; Crofton, 10s. to 16s.

Sydney.—Delicious to 20s. per case. Granny Smith, 15s. to 16s.

Pears.

Brisbane.—Winter Nelis, 10s. to 16s.; Winter Cole, 11s. to 17s.; Josephine, 12s. to 17s.

OTHER FRUITS.

Tomatoes.

Brisbane.—Ripe, 2s. 6d. to 4s.; Choice Coloured, 7s. to 9s.; Green, 3s. to 6s. Northern fruit wasting.

Sydney.—Cleveland, 3s. to 8s. Special coloured lines from Coff's Harbour selling to 20s.

MISCELLANEOUS VEGETABLES, &c.

Cucumbers.—Locals: 5s. to 10s. bushel. Northern: 4s. to 7s. Sydney: 8s. to 14s. bushel.

Pumpkins.—Sydney: 4s. to 6s. bag.

Marrows.—Sydney: 8s. to 9s. large case.

Lettuce.—9d. to 2s. 6d. dozen. Specials: 3s.

Cabbages.—2s. to 3s. dozen.

Beans.—Brisbane: 9s. to 12s. sugar-bag; old, 3s. to 6s. Melbourne: 4d. to 7d. lb.; some old arriving dry.

Peas.—Brisbane: 10s. to 13s. sugar-bag; poor quality lower.

Beetroot.—3d. to 8d. bundle.

Carrots.—Brisbane: 3d. to 8d. bundle. Sydney: 4s. to 7s. quarter.

Parsnips.—9d. to 1s. 3d. bundle.

Rhubarb.—9d. to 1s. 3d. bundle.

SELECTING THE DEEP SUCKER IN BANANA CULTURE.

As the result of the favourable seasonal conditions, banana plantations are now making a flush of suckers. On the selection of the best sucker on each plant will depend the success of the following crop, and the future life of the plantation.

The corm of a banana plant produces at least two rings of buds which at growing periods burst into growth. Of these, the top circle is about 2 inches from soil level and the lower circle is usually 2 or 3 inches below the top circle. Suckers from any of these buds do not send forth the correct follower.

At the base of the corm a bud is produced which bursts into growth at a particular stage in the life of the parent plant. From plantation trials extending over several years, it has been found that the parent plant sends out the correct follower sucker when it has made three-quarters of its growth.

The maturity of a banana plant is governed not by the time it is in the soil, but by the nature of the conditions during its growth. The deep follower produced at the right stage by the parent plant has more vitality, and its roots are deeper, and it retains its sword leaves longer. The shallow follower, on the contrary, develops its mature foliage early and the corm rises above soil level, thereby preventing the effective functioning of its higher root.

The careful digging out of a three-quarter mature plant will reveal the habit of sucker formation, both shallow and deep. If suckers are planted with the side of severance down-hill, the general experience is that the correct follower will invariably appear just where it is wanted—*i.e.*, up-hill.

Brisbane Show (1939) Champions.

Plate 243.
DEVONCOURT SNUG 1661st.—Champion Devon bull, the property of Mr. R. A. Howell.

Plate 244.
DEVONCOURT LUSTY 110V.—Champion Devon cow, the property of Mr. R. A. Howell.

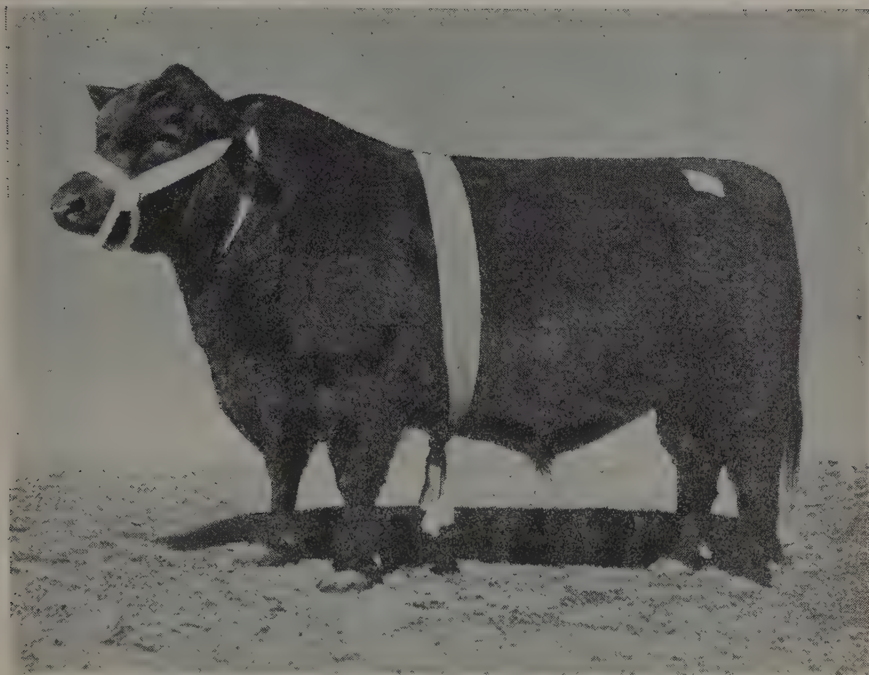


Plate 245.

ABINGTON MAX II.—Champion Aberdeen Angus bull, the property of Mr. N. L. Forster.

Plate 246.

ELEGOSA OF BALLINDALOCH.—Champion Aberdeen Angus cow, the property of Mr. J. M. Newman.

Plate 247.

CHAMPION LARGE WHITE SOW, "MITTADALE PEG." EXHIBITED BY MR. A. T. LEY, KINLEYMORE.

Plate 248.

CHAMPION TAMWORTH BOAR, "WATTLEDALE LUCKY PRINCE." EXHIBITED BY MR. J. BARKLE, SUNNYBANK, Q.

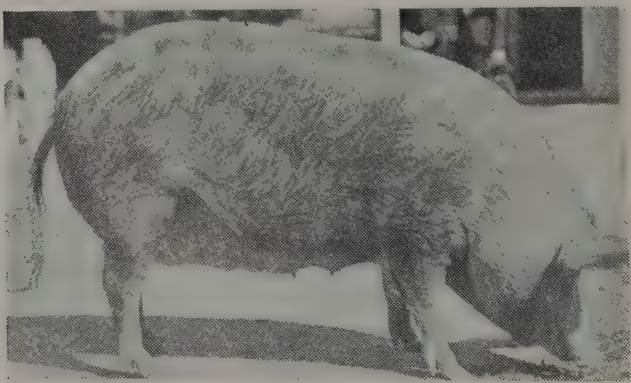


Plate 249.

CHAMPION TAMWORTH SOW. MR. J. BARKLE'S "WATTLEDALE PATRICIA."

Plate 250.
CHAMPION WESSEX SADDLEBACK BOAR. MR. H. THOMAS'S "ARMORE VALE PIONEER."

Plate 251.
CHAMPION WESSEX SADDLEBACK SOW. MR. R. TURPIN'S "PENSILVA ACE 5TH."

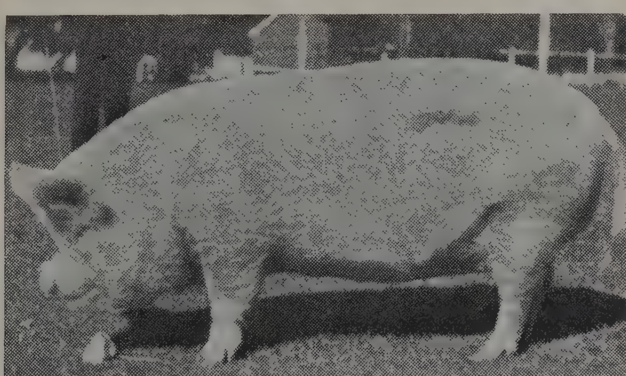


Plate 252.
CHAMPION MIDDLE WHITE SOW, "TURO BORONIA 2ND." EXHIBITED BY MR. J. H. TEAGUE, BELLIMBOPINNI, N.S.W.

Plate 253.

CHAMPION MIDDLE WHITE BOAR. MR. T. WALLACE AND SON'S "QUEEN STATE CORONA 2ND."

Plate 254.

CHAMPION BERKSHIRE BOAR, "MARVEL LONGFELLOW," THE PROPERTY OF MR. H. T. ROGERS, NEWRYBAR, N.S.W.

Plate 255.

CHAMPION BERKSHIRE SOW, "ROSELOCH ESTA." EXHIBITED BY MESSRS. M. PORTER AND SONS, WONDAI, Q.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society production charts for which were compiled during the month of September, 1939 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (STANDARD, 350 LB.).			
Rosenthal Dove 17th	S. J. H. Mitchell, Rosenthal, Warwick	9,596·96	398·437	Rosenthal Carbine
	JUNIOR, 4 YEARS (STANDARD, 310 LB.).			
Merridale Patience	H. D. Giles, Merridale, Biggenden	8,878·6	334·028	Reflection of Blacklands
	SENIOR, 3 YEARS (STANDARD, 290 LB.).			
Chelmer Milkmaid	E. O. Jeynes, Raceview	9,990·15	407·077	Chelmer Douglas
Pilton View Olga 3rd	P. D. Fiechtner, Pilton View, *via* Greenmount	7,836·25	302·088	Navillus Venies Sheik
	SENIOR, 2 YEARS (STANDARD, 250 LB.).			
Blacklands Miss Jean 16th (365 days)	J. Meier, Mount Mort, Grandchester	16,326·2	652·56	Sultan 2nd of Blacklands
Ardilea Broady	W. Hinrichsen, Ardilea, Clifton	7,538·5	328·419	Midget Shick of Westbrook
Ardilea Silk	W. Hinrichsen, Ardilea, Clifton	7,697·5	323·771	Midget Shick of Westbrook
	JUNIOR, 2 YEARS (STANDARD, 230 LB.).			
Laguna Maggie	F. G. Lamkin, Kaimkillenbun	7,094·07	283·001	Morden Marcus
Werona Vale Handsome 5th	A. H. E. Black, Kumbia	5,640·19	280·93	Park View Faro
Cedargrove Gusty 5th	P. D. Fiechtner, Pilton View, Greenmount	7,816	280·058	Cedargrove Winlad
	JERSEY.			
	MATURE COW (STANDARD, 350 LB.).			
Fauvic Rejoice	H. Cochrane, Fauvic, Kin Kin	6,680·9	399·768	Zingara King
	JUNIOR, 4 YEARS (STANDARD, 310 LB.).			
Lorine of Calton	D. R. Hutton, Bellgarth, Cunningham	6,994·21	371·82	Redford Glory's King II.
Oxford Enid	J. Sigley, Millaa Millaa	5,972·65	311·383	Oxford Golden Lad
	JUNIOR, 3 YEARS (STANDARD, 270 LB.).			
Carnation Fair Lassie	R. J. Crawford, Inverlaw, Kingaroy	5,722·37	345·607	Carnation Dainty Boy
Carnation Marie	R. J. Crawford, Inverlaw, Kingaroy	4,954·25	287·304	Carnation Dainty Boy
	JUNIOR, 2 YEARS (STANDARD, 230 LB.).			
Bellgarth Violet 2nd	W. E. Lewty, Leyburn	4,995	275·696	Bellgarth Golden King
Tecoma Pretty	W. Semgreen, Tecoma, Coolabunia	5,063·9	270·102	Bruce of Inverlaw (Twin)
Lermont Bellette	J. Schull, Lermont, Oakey	4,701·55	243·291	Woodside Golden Volunteer
Lermont Bertha	J. Schull, Lermont, Oakey	4,564·9	233·892	Lermont Officer

General Notes

Staff Changes and Appointments.

Mr. A. G. Smyrell, Inspector of Stock, Bowen, has been appointed also an inspector under the Diseases in Plants Acts.

Miss P. Watts (Bundaberg) has been appointed an assistant cane tester for the remainder of the sugar season at the Maryborough Mill.

Constable J. H. Seawright has been appointed also an inspector of brands at Torrens Creek.

Sergeant J. Imhoff (Herberton) has been appointed also an inspector under the Slaughtering Act.

Mr. B. W. Haydock, Thorneside, via Birkdale, has been appointed an honorary protector of fauna.

Mr. W. G. Batchler (West Bundaberg) has been appointed an honorary inspector under "*The Sugar Experiment Stations Acts,* 1900 *to* 1938."

Following are additions to the list of honorary protectors appointed under "*The Fauna Protection Act of* 1937":—Messrs. E. C. Hill, Gracemere; E. H. Lascelles, Goorganga, Proserpine; H. S. Martin and J. Burgess, Bororen.

The undermentioned have been appointed as honorary rangers under "*The Native Plants Protection Act of* 1930":—Messrs. R. J. Ironside and W. L. Gilliam, Dalrymple Heights; A. J. Seeleither, patrolman, Enoggera Waterworks-Mount Nebo road; A. Ross, patrolman, Samford-Mount Nebo road; C. G. Patrick, Mount Glorious.

Constable W. J. Daybell, Rolleston, has been appointed also an inspector under the Brands Acts.

Mr. W. J. Park, inspector of dairies, has been temporarily transferred from Toowoomba to Biloela.

The officer in charge of Police, Townsville, has been appointed also an acting inspector of stock.

Mr. J. Hienchey, Airdmillan road, Ayr, has been appointed an honorary protector under "*The Fauna Protection Act of* 1937."

Mr. W. E. Hamley, Inspector, Diseases in Plants Acts, and agent under the Banana Industry Protection Acts, has been transferred from Burleigh Heads to Brisbane.

Mr. W. R. Vacher, Mackay Cane Diseases Control Board, has been appointed an honorary inspector under "*The Sugar Experiment Stations Acts,* 1900 *to* 1938."

Mr. J. C. Baker, Clerk of Petty Sessions, Nambour, has been appointed chairman of the Moreton Local Sugar Cane Prices Board and an agent of the Central Sugar Cane Prices Board. Similar appointments have been given to Mr. J. Gaffney and H. A. Galloway, Clerks of Petty Sessions at Mossman and Proserpine, respectively, in respect of the Mossman and Proserpine local boards.

Mr. P. Cook, maintenance patrolman on the New England Highway between Rathdowney and Mount Lindesay, has been appointed an honorary ranger under "*The Native Plants Protection Act of* 1930."

Messrs. C. Flesser, J. J. Jope, W. Welch, T. Parker, A. F. Johnson, G. Knight, D. J. MacClelland, C. F. Greenwood, J. C. Muldoon, I. H. Kerr, and C. Kouskos, of the Canungra and Binna Burra areas, have been appointed honorary fauna protectors and honorary rangers under the Native Plants Protection Act.

Sergeant (2nd Class) J. Duhoff (Herberton) and Constable C. R. Kuhl (Adavale) have been appointed also inspectors under the Slaughtering Act.

Rural Development Board—Appointment of Mr. R. P. M. Short.

An Order in Council has been issued under "*The Rural Development Co-ordination of Advances Act of* 1938," appointing Mr. R. P. M. Short, Under Secretary, Department of Agriculture and Stock, to be a member and chairman of the Rural Development Board. In addition to the chairman, the present members of the Board are—Messrs. J. L. Callaghan (member of the Land Administration Board) and E. A. Crosser (Accountant, Treasury Department).

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of Mr. W. D. Francis, Botanist.

Barbed-wire Grass.

D.S. (Maleny)—

The grass is barbed-wire grass, *Cymbopogon refractus.* This grass is a native species widely spread in coastal and subcoastal Queenland. In some districts it is known as ''turpentine grass'' because of its peculiar odour. Stock do not seem particularly fond of it, although it is probably of some value in its earlier stages. It often replaces kangaroo grass in South-east Queensland when that grass is eaten out, and is usually found associated with it.

Regarding paspalum grass, Kikuyu, Rhodes, elephant grass, and clover, we have sent you two pamphlets, Nos. 50 and 52, in which you will find notes on them.

Plants from Rockhampton District Named.

O.L.H. (Rockhampton)—

The specimens from Westwood have been determined as under:—

1. *Ipomoea sinuata,* a member of the convolvulus or morning glory family. A native of tropical America.
2. *Bryophyllum pinnatum* (B. calycinum). A native of tropical regions of the world. Popularly known as ''liveleaf'' or ''live-for-ever.''
3. *Pedilanthus tithymaloides,* a native of tropical America.
4. *Tecomaria capensis,* Cape honeysuckle. A native of South Africa.

None of them is known to be harmful to stock, with the exception of No. 3. This plant might be harmful if eaten in quantity, as it is closely allied to the *euphorbias.* However, it is a garden plant and so far as we know, is not readily accessible to stock. None of the plants is known to cause taint in milk.

The specimens from the Caves have been determined as follows:—

1. *Stachytarpheta dichotoma,* a native of tropical America.
2. *Stachys arvensis,* stagger weed, a native of Europe. This plant causes staggers or shivers in working or travelling stock.

Neither is known to cause taint in milk.

The Common Vetch.

B.B. (Kelvin Grove)—

The specimen is the Common Vetch, known botanically as *Vicia sativa.* It is a leguminous plant native to the Mediterranean region. It is a fairly good fodder, especially in a mixed pasture. If growing densely on a cultivation, it can be ploughed in with benefit as a green manure. In a pasture, it is not such a good fodder plant as the common white clover.

Blady Grass.

D.S.M. (Dunedin, New Zealand)—

The Malayan name ''Malang'' is applied to *Imperata cylindrica,* var. *Koenigii,* the common blady grass. This is very prevalent in New Guinea and the Malayan region. As this species is so common in the grasslands of New Guinea, it is probable that it is the one used for obtaining salt from its ashes.

Parramatta Grass.

M.G. (Peeramon, North Queensland)—

The specimen is one of the rat's tail grasses, sometimes also known as Parramatta grass. Its botanical name is *Sporobolus capensis* (*Sporobolus berteroanus*). It is a native of South Africa. It is an inferior grass which often appears in paspalum pastures when they are eaten fairly low. It also appears alongside paths, and tracks on farms. It is advisable to eradicate it before it obtains a hold on your farm. The grass is most easily destroyed by mattocking.

Corn Spurry.

N.E.H.C. (Nambour)—

The plant is the corn spurry (*Spergula arvensis*). It is a common weed in Europe and temperate Asia, and is frequently seen in Eastern Australia where it is common in sandy loams.

Coast Burr Grass.

W.C.H. (Wondai)—

The grass is coast burr grass (*Cenchrus echinatus*). It is a native of the tropics of the world, and appears to be spreading down the coast from the north. It is a very undesirable grass, especially because of its burrs. It is of little value as a fodder, except in its very young stages. It would be advisable to eradicate it by pulling it up by the roots and burning it.

Medic Burr.

J.P.C. (Rockhampton)—

The specimen is a leguminous plant allied to the clovers, and is commonly known as medic burr. Its botanical name is *Medicago denticulata*. It is a native of Europe, and is now very widely spread in Australia and in Queensland, where it is most abundant on the Darling Downs. It is a good fodder for stock, and its feeding value is somewhat similar to that of the white clover, but will grow in poor soils and drier climates. Like white clover, too, medic burr is likely to cause hoven or bloat in cattle or sheep, if they are turned into a paddock in which it is growing abundantly. Generally, however, it is not present in pastures in sufficient bulk to cause trouble because of that.

Vanilla.

F.W. (Bowen)—

Vanilla has been grown in the Cairns district. As this crop requires a hot and moist climate, there is some doubt whether it would grow in the Bowen district, where the humidity might not be high enough. One reason why vanilla has not been grown commercially in Queensland is the usual handicap of labour. In most countries where the vanilla is grown, cheap native labour is employed.

Phalaris Grasses.

W.M.C. (Gayndah)—

The specimens represent one of the phalaris grasses, *Phalaris tuberosa* or *Phalaris minor*. These two plants resemble each other very closely, and it is rather difficult, in the absence of ripe seed, to determine them, without knowing whether the plant is a perennial or annual. *Phalaris tuberosa* is a perennial species, while *P. minor* is annual. The former, naturally, is much more valuable as a fodder, and is fairly extensively cultivated on the Darling Downs. *P. minor* often occurs as a weed of cultivation, but is sown to a slight extent. Both are related to the Toowoomba canary grass (*Phalaris canariensis*).

Rural Topics

More about Cowbail Ballads.

There must be something in this idea of the susceptibility of milking cows to music, and that they let down their milk very much easier when their ears are tickled with a "concord of sweet sounds." At least one dairy farmer who is determined to try the idea out on his place on one of the rivers just below the New South Wales border, has installed an all-electric wireless set, from which music flows while the cows are being milked with machines. We hope yet to learn, however, what a cow's musical taste may be—whether it extends to grand opera or not, or whether she responds to jazz tunes or crooning. It would be "a fair cow" if the morning physical jerks session were accidentally turned on! Time will tell, and who knows but that some day we shall have a special musical broadcast for milking time.

Clothing made from Milk.

The United States Agricultural Department reports the development of methods of production of synthetic wool from casein. It is stated that to make a suit of men's clothing from the material approximately 5 gallons of milk are required. The total cost of a pound (1 lb.) of casein "wool" is given at half a dollar, and as the material required for a suit weighs about 3 lb., the total price would be a dollar and a half, or about 6s. in Australian money—a figure very much lower than for the equal weight of a genuine woollen cloth. The yearly milk yield per cow is stated to suffice for the making of thirty-five men's suits, and at present the U.S.A. is producing 35,000,000 lb. of milk casein a year. The report adds that as the possibilities of milk production in the States are unlimited, the yearly output of casein could be easily increased.

Stilts in the Orchard.

Stilts are coming into use in orchards in the United States in place of ladders. The stilts are said to be safer and speedier in getting around. The stilts are made of adjustable tubes of aluminium alloy, one tube sliding inside the other. The tubes can be locked in any stage, increasing the wearer's position above the ground from between 2 and 3 feet to nearly 6 feet. The cast aluminium footplates are also adjustable for different-sized shoes. Each stilt weighs 9 lb. On one of them a carrier is provided for pruning and other tools.

Electricity for the Countryside.

The recent electricity agreement under which a large area of the countryside extending along the near North Coast will be served with electricity before long, opens up all sorts of possibilities for the farm and the farm home in districts at present outside the range of electricity supply.

Electric power has made a wonderful difference to the life of the man on the land—and to the women on the land as well. It has lightened the burden to both the farmer and his wife in very many ways. Wherever a supply is available, electricity has revolutionised rural conditions and on the farm, in some instances, it has converted drudgery into comfortable and pleasant work.

Quick Ripening of Tomatoes.

A new method for the quick ripening of tomatoes with the aid of oxygen has been developed by science workers in Russia. Green tomatoes placed in a room and subjected to the effect of oxygen ripen within six days, while, ordinarily, under cold climatic conditions the ripening process takes over a month. At present nearly eight thousand (8,000) acres are planted with tomatoes in the Leningrad province of Russia, in addition to large quantities grown under glass. The new method is regarded as of considerable value to tomato growers and canneries.

Goat Dairies.

America now has licensed goat dairies, in which all equipment is sterilised and the milk, after cooling, is bottled in sterilised cartons. The industry is growing, and for goat's milk it is claimed that it is sweet and palatable and rich in the elements necessary for nourishing the human body.

Reducing Lightning Risks.

Valuable animals are often killed by lightning, and in Queensland the experience is not uncommon. Here is a suggestion from an engineer for protecting wire fences from lightning charges. Cattle often camp alongside a fence, especially if it is anywhere near a shelter belt of trees, during a storm. Along every sixth post in the fence a heavy wire is extended across the fence wires and into the ground. Strong staples are used to keep the crossing wire contacts. These grounding or earthing wires are set more closely along the fence near shade trees and other spots where animals usually camp.

Snake as an Incubator.

Five chickens hatched in Matara, South Ceylon, recently had the extraordinary experience of having been for some time in the stomach of a snake. It appears that a couple of days before the chickens were hatched, a snake swallowed seven eggs while the hen was sitting on them. This was noticed by the poultryman, who later killed the snake, cut it open, and retrieved the eggs from the reptile's in'ards. Two of the eggs were broken; the other five were washed and placed again under the sitting hen, and two days later five healthy chickens were hatched.

Oratory and Cheese.

No anthology contains a poem in praise of cheese, but that article of diet, if it inspires no verse, seems, at any rate, to be capable of stimulating oratory. In the course of a recent debate in the United States Senate on foreign policy, a senator created a temporary diversion (in two senses of the word) by calling attention to the national service rendered by his own State as the home of 185,000 dairy farms and 2,000 cheese factories. Having expended much eloquence on Wisconsin's "juicy grasses," "sweet-scented clover," "luscious lucerne," and "cool spring water," he predicted that if his colleagues in the Senate would eat more Wisconsin cheese it would make them more "rational and reasonable," and would enable them to maintain the suppleness, vitality, and stamina of youth. The worthy senator went on to claim that an increase in its eating would prevent tuberculosis, would cure nervousness in children, would make rouge unnecessary for women, and ——well, that's enough. But anyhow, there is no doubt that his own State and industry lost nothing by his advocacy.

Pigs Killed by Kindness.

Here is the experience of a New Zealand farmer which shows how animals can be killed by kindness. In this case, the farmer fed his pigs on meal and skim milk right from the store stage up to the point when he had a top line—so it looked—of six splendid baconers. He sent them to the factory and they were all condemned. He was astounded when he got the report and started straightaway to investigate. The pigs were condemned as unfit for human consumption, through pleurisy and pneumonia, from which tuberculosis had developed.

"Impossible," he told the slaughtering inspector, "Why, my fattening pens are quite draught-proof, the pigs are bedded almost out of sight, and they are never cold. How could they get pneumonia?"

He then was questioned more closely as to his methods, for the inspector was a bit curious himself. They had been such a fine lot of baconers. It was then revealed that every evening the farmer made a practice of forking in fresh hay for bedding, but instead of cleaning out the old litter he continually spread the new hay on top. As time went on, the bedding grew until the pigs were almost out of sight at night time. That was the actual cause of the trouble. Each night the cold from wet underneath layers of hay struck upwards, while on top the pigs were too warm. For the pigs, it was like sleeping with a radiator at one side and a refrigerator at the other. No wonder the pigs died of kindness!

Beef in Rubber Wrappings.

An experiment in wrapping frozen meat in rubber is now in progress and results are awaited with great interest. Last May a parcel of frozen beef wrapped in rubber was shipped from Brisbane and we have yet to learn what Smithfield has to say about it. Some little time ago an experimental shipment of lamb in rubber wrappings was sent to London from New Zealand and reports from Smithfield on its turn-out were quite enthusiastic. The wraps are made of latex rubber, and are said to leave no odour or taste in the meat. After being expanded, the rubber containers are slipped over the meat and made to shrink tightly around it, forming a close protective and transparent skin, which is said to be very tough under low temperatures and to protect the meat during shipping.

A Good Droving Job.

Queensland drovers have many fine records to their credit, and another good one was put up recently when well over 5,000 cattle were delivered on Tanbar after twelve weeks on the road from Rocklands in the Northern Territory. From Rocklands to Tanbar—which is on Cooper's Creek in Far Western Queensland—the distance is 720 miles, and the delivery was made practically without the loss of a beast. The cattle—Shorthorn steers and cows chiefly—travelled in four mobs and did the long journey without loss of condition. Before setting out the cattle were inoculated and dipped, and this performance is a tribute to their constitution and walking ability.

Cattlemen will be interested in the method adopted on Rocklands to get young cattle used to handling while on the road. At weaning time they are taken in hand by a station team of musterers and herded by day and yarded every night for a fortnight. They are watered, of course, before being yarded for the night. To accustom them to even closer handling, after being yarded, the station hands walk and ride close to the cattle all night. They thus become quite used to men moving among them once they are started on the road. Consequently, they make good campers on the stock route, and all risk of rowdiness or rushing is cut out. To travel 60 miles a week for three months and hold condition and to be delivered without loss speaks for the droving ability of the men in charge.

Examine Horses' Bits.

It is a good thing to see that the bridle bit is not worn at the ends, or in the centre, if a two-piece bit.

A few years ago, while looking at a man's team, I was wondering why their mouths were sore at the outside, or at the end of the bits (writes a correspondent). I told him that his bits had got worn sharp where they connect with the ring on the bit. This is caused by the bit being worn sharp with a lot of wear or through very long usage. A person should keep a lookout for this trouble, as wear of this kind makes a lot of misery for the poor dumb animal, and especially if he has a cruel or thoughtless driver.

When a bit becomes worn it should be thrown away, as new ones cost very little and they would mean a lot of comfort for the horse. We should remember that the horse is one of our most faithful servants, and all he gets in return is his living. He cannot speak for himself. Neither has he any hands like we have. His lips convey the food to his mouth. He appreciates kindness shown him. The Scripture says: "A merciful man is merciful to his beast." Sometimes well-meaning people fail to notice little things of this kind.

—*The New Zealand Farmer.*

Good Milk Publicity.

The English Milk Publicity Council has produced a pleasing poster which is a cut-out of a charming, smiling girl against a blue background, with the slogan on a strip in the foreground—"It's not Luck—it's Milk."

An All-Electric Farm.

No dim journeys with a hurricane lamp on winter mornings. Cow-bails lit by electricity; above them a motor light casting a beam across the pig pens. Milking machines and separator electrically driven, and skim milk pumped direct from the separator room to the pig-feeding troughs. It all sounds like a farmer's dream, yet it is an actual fact on a Dorrigo dairy.

In addition, silage is raised from a pit silo by an electric hoist and chaffed by electric power. Water from a big well is delivered to the bails and to the house, and work in the home is lightened by various electrical appliances. Even the firewood is cut by electric power. Dairying is done in comfort, and all the old drudgery has gone.

It sounds fantastic, but there it is. Electricity has been applied to every dairy operation on this farm at North Dorrigo, below the border in New South Wales. And the cost of all this "white coal," which comes from the Dorrigo power plant on the Beilsdown River, is only £17 10s. a year!

In its schemes for extending the use of electricity, the Queensland Electricity Board, no doubt, visualises its application to rural industry in districts in which either hydro-electric plants are practicable or which are within reasonable reach of power-houses already established.

A New Way to Use Whey.

New facts have been brought to light on the make-up and value of whey for general purposes. A new evaporating plant for this milk by-product is now in use in Denmark, and it promises excellent results. Although Danish farmers use a large quantity of whey for animal-feeding, an enormous surplus quantity has had to be run off during cheesemaking, and which has had until now no commercial value. The evaporation process produces a solid product which can be mixed with bran and other substances used in stock foods. The solid content of whey is 6 per cent., and, provided that the cost of evaporation can be kept low enough to prove a commercial proposition, there seems to be no reason why the new process should not be of great value to the dairy industry.

In Denmark especially—and it is conceivable that the same thing may happen in Queensland—the utilisation of every dairy by-product is of first-rate importance. It has, therefore, been decided that the new stock food will be made use of on Government farms in different parts of Denmark to determine its value.

An Experiment in Foodstuff Distribution.

America is trying an experiment in the distribution of farm products. To people in receipt of public relief tickets which will enable them to collect sixpence-worth of certain surplus foodstuffs for every shilling they receive from public funds are being given. Thus, a person who draws £1 a week in ''dole'' can also draw ten shillings-worth of certain foods. The chief commodities concerned at present are oranges and dairy products; it is possible that meat also may be included later.

That certainly means extending the home market for foods in over-abundance, and it will be interesting to read the results of this new experiment in rural economics.

Isolation Pen for Sick Pigs.

The distance between isolation pens for sick pigs and the pig yards or dairy structures is not so important as the relationship of these structures from another point of view. Thus, while advising a minimum distance of, say, 150 feet, it should be emphasised that such isolation pen should be so placed that—

(*a*) No drainage from it can spread to the main sties or any of the dairy buildings; and

(*b*) That if healthy pigs are allowed to wander, the isolation pen should be so guarded that they cannot make contact with it.

Ordinarily, therefore, the isolation pen should be on lower ground, and, if in the paddock in which pigs wander, should be protected by fencing in such a way that healthy pigs cannot come in contact with it.

Wholesome Milk.

Normal milk can only be produced by a normally healthy herd, fed on wholesome and non-taint-producing fodders. If only one cow in the herd is not in normal health her milk production will be sub-normal and, if mixed with the milk from the remainder of the herd, the quality of the whole may be seriously affected. Cleanliness should be exercised during the whole process of milking, and all utensils and surroundings kept clean.

If the milk is intended for human consumption, cooling and aerating will allow the feed flavours to be given off, and the reduction in temperature will check bacterial development.

Control of Moths in Woollen Fabrics.

It is reported that the Scientific Research Institute of Soviet Russia has discovered a process by which woollen materials can be protected from the ravages of moths. The process is said to consist of saturating the wool with special fluoride compounds at the same time as it is dyed or washed, and that it can be done without complicating mill production.

Dairy Production in Queensland.

Queensland supplies almost half of Australia's exports of dairy products. Here are the latest official figures: The production of Queensland butter has increased by nearly 50 per cent. and butter exports from the State have almost doubled. That is in addition to supplying nearly half of the total Commonwealth butter exports.

These figures are revealed in a summary of the activities of the dairy industry during the first half of the 1938-1939 season by the Commonwealth Statistician.

Merino Fleece Quality.

Investigations now being made at the McMaster Animal Health Laboratory seem to lead to the conclusion that, with a better knowledge of skin characteristics, sheep breeders may be in a better position to improve both the quality and quantity of their fleeces.

A special study of various factors associated with weight and density in merino fleeces—two things every sheep man is interested in particularly—is being made. If certain present indications are confirmed fresh fields of sheep-breeding will be opened up. What is being done, among other things, are detailed studies of the microscopic structure of merino sheep skins and the number, type, and arrangement of the wool fibres in different parts of the body surface. Microscopic studies may, under the new technique which is being developed, give a clue to some of the chief things sheep men may want to know about the covering of the particular sheep under observation.

Not the least important determination which can be made by this means is the number of fibres per square inch of the sheep's skin—a factor of very great importance in fleece density and one having great influence on the weight of wool produced by any sheep.

The structure of the skin, as studied under the microscope, may determine the type of fleece and, to a large extent, the amount of wool an animal may produce, and may also determine the way in which the sheep will respond to its environment.

So far, this work is still in the laboratory stage, but so promising have been the results to date that big things may be expected before very long.

Music in the Stockyard.

The old maxim that "music hath charms to soothe the savage breast" is often misquoted as "music hath charms to soothe the savage beast." Now we know why—or at least we have some justification for the misquotation. At the Smithfield fat stock show in London (as reported in the *New Zealand Farmer*) recorded music by the old masters was played in order to keep the stock fat and happy. It seems, according to the show secretary, that the excitement of being on exhibition for a week often makes fat stock lose weight. Hence music to cheer them up and keep their condition. The secretary cites the example of milkmaids singing as they milk contented cows, the music presumably making them contented. But the fat stock exhibitors are using real guile in their selection of appropriate music. Naturally, Beethoven's "Pastoral Symphony" has first choice. Bach's compositions are considered to be too restless, and selections from Wagner are likely to make the milk curdle. Mozart and Hadyn sends the fat cattle to sleep, and Delius' "On Hearing the First Cuckoo in Spring" makes the fat wethers remember their youth. Highland steers show pleasure when the bagpipes are played, but the pipes cannot be kept going too long because of the acute stress it causes among the non-Scottish breeds of stock. After that—and if it is true—who will dare deny that "music hath charms . . ."?

Care of the Fat Lamb Ewe Flock.

Some farmers have the prospective mothers of the fat lamb drop too fat for the purpose. This is wrong in two ways. Firstly, with too much condition a light lambing is likely; and, secondly, feeding the ewes at mating time on grown crops is wasteful and unnecessary.

The ewes should be in strong store condition. It is advantageous to "flush" the ewes on green feed a fortnight before mating. No feed is too good for the flock when the lambs are dropped.

Beware of jetting with an arsenical preparation before joining. This results very often in a poor lambing. If jetting is necessary, the job should be done six or seven weeks before the rams are joined.

Crutching the ewes a month before lambing is advisable.

Careful watch should be maintained for internal parasites, and systematic drenching undertaken so as to free the ewes of the pest long before the lambing season.

Avoid unnecessary yarding with the in-lamb ewes.

Provide a lick suitable to compensate for known deficiencies in the pastures.

Pedigree Stock Breeding.

Great Britain is often referred to as the world's stud stock farm, so looking through the last annual reports of several breed societies it is not surprising to learn that pedigree stock-breeding was the brightest section of British agriculture in 1938. Good beef bulls were in good demand, and although no record export prices were realised, it was evident that overseas confidence in British pedigree stock continues at a high level. Many excellent types were exported to Australia, an influx of new blood which is very welcome.

Another interesting fact reported is that, although some lamb producers are under the impression that twin ewe lambs are liable to be sterile, this is not the case, and in fact many studs of British breeds of sheep are built up on twin ewes in order to give increased fertility, and drops of over 200 per cent. are not unlikely in such cases.

Molasses as Stock Food.

Some interesting observations on the effect of placing molasses in the drinking water troughs for sheep have been recorded in the Riverina district in New South Wales. The effect was definitely beneficial on sheep in dry areas.

Another method of using molasses has been tried successfully in Queensland, and that is by spraying it on to dry grass, which is thus made palatable to stock. Where it has been tried in a dry time, the sheep follow in the tracks of the sprayer and eat up every blade of the sweetened grass, and, incidentally, eat out an area which becomes, in consequence, an effective fire break.

Molasses spraying of dry pastures has interested quite a number of pastoralists, with whom it has become merely a question as to the quickest and cheapest way of spraying it. Spraying, however, has not yet become practicable on anything like a big scale.

Future of the Fat Lamb Industry.

One of the foremost authorities in fat lamb raising in the South said in the course of conversation recently that, in his opinion the future of the lamb industry lies not only in the finding of new markets, or in the exploitation of the home trade, but in the growers themselves forming a definite policy as to what they are going to breed on their farms and sticking to it.

This is the only way in which continuity of supply and uniformity of type can be guaranteed. There is no doubt that he has hit the nail squarely on the head, for, as anyone who has had some experience in the business knows, switching and swapping from lambs to wool and back to lambs—as one or other becomes more profitable—is not a very wise practice. The man who does that is always a season too late to get any benefit from his chopping and changing. The fact is that a policy should be planned and stuck to consistently in order to get the best of the available market.

Fat lamb raising is not just a sideline job, and it is good business to concentrate either on meat or wool; it is obviously no good trying to do both, especially if export restrictions are applied. If that happens, the man with the quality lamb will come out on top of the grower of the inferior type. The grower's job really is to find the ideal types for his own district, settle that type, and cut out all the rest. It is possible to have too many breeds, and reduction of breeds to a minimum is the first step towards uniformity of type.

Having decided the policy and the type of sheep best suited for a district, the next thing is to get the land into condition to carry out those plans. Pasture improvement is essential. So also is an adequate reserve of fodder to provide supplementary feeding in a dry time. The lamb should not be exposed to the risk of a check in development at any period of its growth. Once checked, it is a difficult job to start it growing again. And here is another point: Much of our lamb-raising country has a short season and lambs must be got off before the grass seed falls or the feed dries off.

The Tail of a Cat.

Things happened when a cow that a farmer was milking stepped on a cat's tail. The cat scratched the cow; the cow kicked the farmer's wife and broke her left leg. When the farmer tried to pull his wife from under the cow, the animal became excited and kicked the farmer, breaking his left leg, and that's that. *Moral: Keep cats out of the cow yard.*

Farm Notes

DECEMBER.

EARLY-SOWN crops of sweet sorghums, Sudan grass, millet, and maize, intended for fodder purposes, will now be in an advanced stage of growth, and where pastures are in fair condition there may be a surplus over immediate requirements. Every effort should, therefore, be made to conserve any surplus growth in the form of silage, hay, or stover.

Trench, pit, or stack silage is recommended as economical and profitable means of conservation where an overhead concrete silo is not available. However, it is the autumn-harvested crops which usually provide the greatest bulk of conserved fodder, so December sowings of suitable bulky summer fodder crops are best for that purpose.

In localities where lucerne does not make satisfactory growth, the cowpea will often provide an alternative protein-rich fodder, besides being a valuable rotation crop of benefit to the soil. Cattle will not take readily to green cowpea, preferring the fodder in an advanced stage of growth, but once accustomed to it, they will graze freely on it.

Sowings of main crop maize will be continued during the month where conditions are suitable, utilising late-maturing varieties such as Improved Yellow Dent, but in districts where early frosts are experienced, the mid-season or early varieties are preferable.

Buckwheat is recommended as an early-maturing alternative fodder crop, or as green manure where it is desired to plough under within 6-8 weeks. Besides being a good fodder, buckwheat is valued as a bee plant, while the seed makes excellent poultry feed. Wheat-harvesting will be practically finished this month. Growers are therefore advised to give the land a preliminary working immediately after the burning or grazing of stubble, in order to conserve succeeding summer rains to the fullest extent. Even where the land is too hard for adequate ploughing, a light working with disc cultivation or sundercut will be found very beneficial.

Experience in recent years has proved that adequately summer-fallowed land invariably produces profitable yields.

December is usually a busy month, through the successive sowings of a variety of fodder and grain crops, together with the scarifying of row crops already established.

CHEAP HORSE BRUSH.

To make a horse's body brush from an old yard broom, cut the back of the broom as shown by the dotted line. Nail a wide piece of leather on to the wooden part, trim the bristles, and the brush is finished.

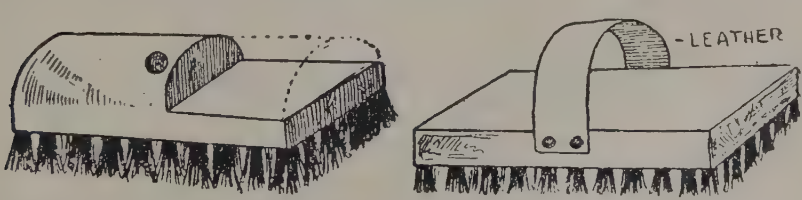


Plate 256.

Orchard Notes

DECEMBER.

THE COASTAL DISTRICTS.

PLANTING of pineapples and bananas may be continued, taking care that the ground is properly prepared and suckers carefully selected, as advised previously in these Notes. Keep the plantations well worked and free from weeds of all kinds, especially if the season is dry. New plantations require constant attention, in order to give young plants every change to get a good start; if checked when young, they take a long time to pull up and the fruiting period is considerably retarded.

Citrus orchards require constant attention; the land must be kept well worked and all weed growth destroyed. Spraying for scale insects should be done where necessary.

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to quit.

Peaches, plums, papaws, and lemons will be in season during the month.

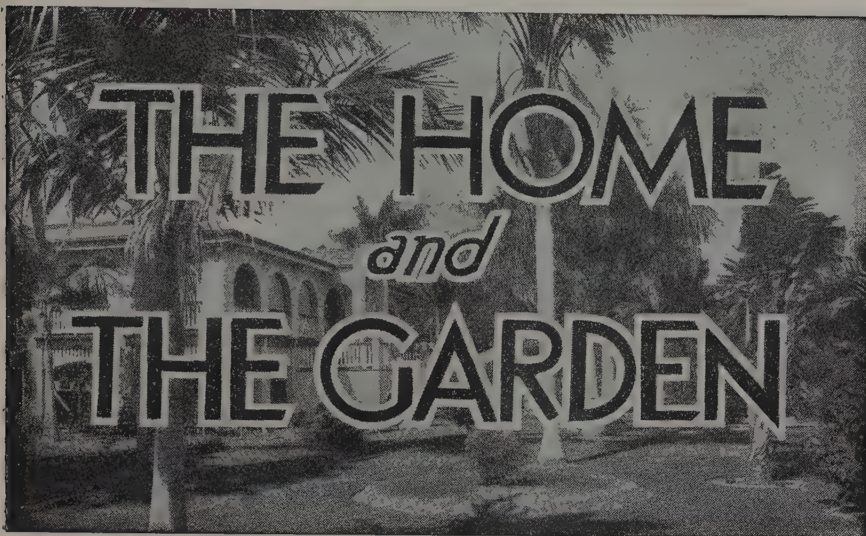
Examine potatoes and tomatoes for Irish blight, and melons and kindred plants for downy and powdery mildew. Use bordeaux or burgundy mixture for Irish blight and downy mildew, and sulphur dust or lime sulphur spray for powdery mildew.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

EARLY-ripening apples, plums, apricots, peaches, and nectarines will be ready for marketing during the month. They are unsatisfactory lines to handle. The season of any particular variety is so short that it must be marketed and consumed as quickly as possible. All early-ripening deciduous fruits are poor carriers and bad keepers, as their flesh is soft and watery, deficient in firmness and sugar, and cannot, therefore, be sent to any distant market. Early-ripening fruits should, therefore, be carefully graded for size and quality, handled and packed with great care, and nothing but choice fruit sent to market.

Orchards and vineyards should be kept in a state of perfect tilth, especially if the weather is dry, so as to retain the moisture necessary for the development of the later-ripening fruits. Where citrus fruits are grown, an irrigation should be given during the month if water is available for this purpose, unless, of course, there is a good fall of rain to provide an ample supply of moisture.

Codling moth and fruit-fly regulations should be observed in order to keep these pests under control; otherwise the later-ripening fruits are likely to be attacked severely by these pests.



Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

MATERNAL AND CHILD WELFARE SERVICE.

History.

SOON after our Welfare Centres, which were known as Baby Clinics, were established in Queensland in 1917 by the Government, a booklet, containing thirty-one pages and entitled "Notes for Mothers," was distributed to the mothers by the Clinic nurses. In 1924 the booklet underwent revision, parts being rewritten and additions made, and it grew to twice its original size. In 1928 a further revision was carried out, and the volume issued from the press under the title of "The Queensland Mothers' Book." Since that time revisions and additions have been made periodically. During the last year the book underwent further revision, sections of it were re-written and additions, including several illustrations, were made. As a result of this the volume became so bulky that it was decided to publish it in two parts, one part being entitled "Care of Mother and Child," the other "The Expectant Mother." These are being issued to mothers at the Maternal and Child Welfare Centres.

Each part contains a foreword by the Hon. E. M. Hanlon, M.L.A., Minister for Health and Home Affairs, and a preface by Sir Raphael Cilento, Director-General of Health and Medical Services.

For the Mothers of Queensland.

The books are written for the use of the mothers of Queensland. The directions and advice given are founded upon the experience in the

care of expectant mothers and in the feeding and care of infants and children up to school age gained during the last twenty-one years of Maternal and Child Welfare Service throughout the State. While it is hoped that mothers will read these books, and put them away carefully where they can find them when they need them, we do not wish them to think that, when they possess these books, it will be no longer necessary for them to visit the Welfare Centre.

Every Child an Individual.

Each child requires to be studied individually, and a personal interview with a nurse, who is specially qualified to advise mothers, is worth much more than the reading of books. Mothers are advised to read the books in conjunction with regular visits to the Welfare Centres.

Advice by Correspondence.

Mothers living in sparsely populated areas and those who, for one reason or another, are unable to visit these centres, are invited to write to the nurse in charge of the nearest centre, and give her the particulars of their children's progress, notes on which they are invited to make on the plain sheets included in the books.

Mother and Child.

After stating the aims and objects of the Maternal and Child Welfare Service, this book describes the conditions essential for baby's health. In the section on infant feeding, stress is laid upon the value of natural feeding, and upon the fact that almost all mothers can feed their babies, either wholly or partly, if they desire to do so, and that even a small quantity of natural food is valuable and helps baby to digest any artificial food which he may need. It is pointed out that mother's milk is always ready and no troublesome preparation is required.

In cases where they experience any difficulty mothers are recommended to seek the help of a child welfare trained nurse. For use in the feeding of older children menus are included. Suggestions for the fillings of sandwiches for school children are made. Chapters on the care of the teeth, the training of the child, and the prevention of disease follow. The first-aid treatment of emergencies is given. Information regarding the choice preparation and cooking of food is provided, and many recipes are included. Reference to Western difficulties is made in another section. The book finishes with a few hints on economical housekeeping.

THE EXPECTANT MOTHER.

Ante-Natal Care.

This book opens with a section on ante-natal care and healthy motherhood. A section is devoted to the expectant father who can do much to help his wife during her period of expectancy. He is urged not to treat her as an invalid, but to encourage her to continue her usual interests, to take regular exercise stopping short of fatigue, to have sufficient sleep, fresh air, sunshine, and recreation of the right kind. The husband is advised to see that his wife receives the necessary ante-natal care from the earliest months and to assist her in carrying out the instructions which she received in regard to diet, care of the teeth, and general health, all of which aim at keeping her well and contented.

Special Exercises.

A list of special exercises is included. These are designed to improve her muscle tone as well as her general health.

Clothing.

Recommendations in regard to clothing are made. Directions for making a maternity belt are given.

Diet.

In the section on diet, requirements of the expectant mother are dealt with in some detail. The importance of milk, cheese, butter, eggs, meat, vegetables, fruit, and bread containing wheat-germ, is emphasised. Specimen menus for one day are included.

Complications.

Advice in regard to the complications of pregnancy is given.

Post-Natal Care.

The care of the mother and the child following the confinement is dealt with.

Special Exercises.

These are planned to enable the mother to regain muscular tone. It takes a little time to do these exercises, but if they are begun early, and continued regularly, the mother will be well rewarded by her increased fitness, by her feeling of wellbeing, as well as by her improved appearance.

Baby Clothing.

In the Appendix, illustrations of patterns and directions for making baby's outfit are given. These include vest, petticoat, dress, nightgown, jacket, bonnet, and shawl.

These books are issued at the Maternal and Child Welfare Centres, and mothers are invited to apply personally to the sister in charge of the nearest centre (Baby Clinic).

Plate 257.

ON THE WAY TO SCHOOL.—A charming group study on the Goomeri-Gayndah road, near Boubyjan. The lake in the background is part of a sanctuary for wild fowl and is usually teeming with bird life.

IN THE FARM KITCHEN.

FOR HUNGRY HOLIDAY-MAKERS.

PICNIC MEAL I.

Jellied Veal.
Salad and Dressing.
Apple Tartlets and Cream.
Flummery.
Picnic Loaf Cake.

Jellied Veal.

Take 1 lb. cooked veal, ½ lb. cooked ham, ¼ teaspoonful nutmeg, ¼ teaspoonful pepper, 4 hard-boiled eggs, 1 oz. gelatine, ½ pint clear stock, salt to taste.

Mince finely the veal and ham. Season with nutmeg, pepper, and salt. Cut the hard-boiled eggs into thick slices. Take a square or oblong mould and fill with alternate layers of sliced eggs and minced veal and ham. Dissolve the gelatine in the stock, and when just hot pour into the mould. When cold, remove from the mould and serve on a bed of lettuce.

Apple Tartlets.

Take ½ lb. good short pastry, 6 apples, 4 oz. sugar, 1½ gills water, cloves.

Peel 1 quarter, and core the apples. Make a syrup by bringing water and sugar to the boil. Add apples and a clove or two and cook until quite tender. Beat well and allow to cool. Roll the pastry out thinly and cut into rounds, using a large cutter for the rounds to line the patty-tins and one a little smaller for the covers. Line the tins, fill with apple, wet the edges of the pastry with water, and cover the top. Make a small hole in the centre to allow the steam to escape. Glaze top with water and sprinkle with castor sugar, and bake in a quick oven until pastry is crisp and a pale brown. Turn out of tins to cool.

Flummery.

Take 1½ cupfuls cold water, 1 small cupful sugar, 1 tablespoonful gelatine, 1 tablespoonful flour, 6 passion fruit or three oranges.

Blend the flour quite smoothly with a little water. Put flour, sugar, gelatine, and water into a saucepan and stir till boiling. Boil well for seven to ten minutes to thoroughly cook the flour. Pour into a basin to cool. When cool, add passion fruit, or, if oranges are used, the grated rind and juice. Beat in a cool place till stiff and creamy. Pile into a deep dish and place on ice till required.

Picnic Loaf Cake.

Take ¾ lb. sifted flour, ½ cupful cleaned currants, ½ cupful stoned raisins, 2 oz. glace cherries, ½ teaspoonful salt, 8 oz. butter, 2 eggs, 1 cupful castor sugar, ½ cupful mixed candied peel, 1 oz. blanched almonds 3 teaspoonfuls baking powder, ½ cupful milk, ½ cupful sultanas.

Beat butter to a cream with the sugar. Sift flour with salt and baking powder into another basin. Beat eggs well, add to butter, and add flour and milk alternately to beaten eggs until all these ingredients are incorporated. Stir in chopped peel and almonds, halved cherries, chopped raisins, currants, and sultanas. Bake in a greased loaf-tin lined with two layers of greased paper in a moderate oven for one and a-half hours.

PICNIC MEAL II.

Aberdeen Sausage, Cold Ham.
Tomatoes.
Large Mince Pie.
Coffee Sandwich.

Aberdeen Sausage.

Take 1 lb. lean steak, ½ lb. bacon, 1 egg, 1 cupful breadcrumbs, 1 tablespoonful tomato sauce, 1 tablespoonful Worcester sauce, salt and pepper to taste, browned breadcrumbs.

Mince the steak and bacon and add them to the other ingredients. Beat the egg, add the sauces, and stir into the meat mixture. Mix well and form into a sausage shape. Place in a well-greased pudding cloth; roll up and tie the ends

securely close to the sausage. Stitch up the centre of the cloth to keep the water out. Put into a pan containing plenty of boiling water and boil steadily for two hours. Unroll and cover all over with browned breadcrumbs and allow to get quite cold. Garnish with salad and parsley.

Large Mince Pie.

Take about 1 lb. flaky pastry, mincemeat as required.

Roll out the pastry to almost a quarter of an inch thick. Take a sandwich tin and cut a round large enough to cover the top. Again roll the remainder of the pastry thinly and cut out a round large enough to line the tin. Press it into shape and fill with mincemeat. Damp round the top edge of the pastry and fix the lid on to it. Press the edges together. Decorate the edge with a fork. Brush over with milk. Bake in a hot oven for about twenty to thirty minutes, and until golden brown.

Coffee Sandwich.

Take ¼ lb. butter, 6 oz. sugar, 8 oz. flour, 3 eggs, 1 teaspoonful baking powder, 1 tablespoonful rice flour, 3 tablespoonfuls coffee essence, ½ lb. icing sugar.

Cream the butter and sugar, add beaten egg-yolks, then sifted flour, baking powder, and rice flour, one tablespoonful coffee essence, and lastly fold in stiffly-beaten egg-whites. Divide between two well-greased sandwich tins and bake in a moderate oven for from fifteen to twenty minutes. Turn on to a sieve to cool. Put together with jam or whipped cream and cover with a soft icing made by mixing two tablespoonfuls coffee essence with half a pound of icing sugar just warm, and pour quickly over the cake.

The following recipes will also help the picnic hostess:—

Moulded Tongue.

Take 4 cooked sheep's tongues, ¼ lb. ham, 2 hard-boiled eggs, chopped parsley, 1 pint savoury jelly, a few stuffed olives, 2 sweet gherkins.

Cut the tongues in slices and ham in small pieces, slice the eggs, chop the parsley, and cut olives and gherkins in slices or strips. Set a quarter-inch of jelly in the bottom of a mould; a square or diamond shape looks more effective. Arrange the ingredients in layers, setting a little jelly between each layer. When the mould is completely filled, set in the ice chest to become quite firm. Serve with salad and a suitable dressing with it. Substitute cooked rabbit for tongue for moulded rabbit.

Vegetables in Jelly.

Take 1 cupful celery cut into dice, ½ cupful diced carrots, ½ cupful green peas, ½ cupful cooked haricot beans, ¼ cupful diced beetroot, ½ cupful shredded white heart cabbage, ½ cupful chopped walnuts, 1 tablespoonful gelatine, ¼ cupful cold water, 2 cupfuls boiling water, 2 egg-yolks, pinch dry mustard, pinch pepper and salt, ½ pint best olive oil, 1 tablespoonful white wine, vinegar.

Cook and prepare the vegetables, but slice up the cabbage raw, and if liked the celery may be put through the mincer. Mix all the vegetables together. Dissolve the gelatine in cold water, then add the boiling water, stir till this is well mixed and leave till it begins to set, then mix this with the prepared vegetables. Rinse a mould out with cold water, put the gelatine and vegetables in this, and set away till required. Make a mayonnaise and then turn out the vegetable mould, pour the mayonnaise over and decorate with chopped walnuts.

TO MAKE THE MAYONNAISE.—Beat up the egg-yolks, stir in the dry mustard, pepper, and salt, and mix well, then add the white wine, vinegar, and beat well. Next pour in the olive oil drop by drop, beating thoroughly. This home-made mayonnaise may be used for all kinds of cold dishes. A tablespoonful of cream may be added.

SANDWICH FILLINGS.

Cheese and Mustard.

Put cheese and mustard pickle through the mincer together, using proportions to suit the taste. Spread on buttered bread.

Cheese Sandwich.

Cream the yolk of a hard-boiled egg with one tablespoonful melted butter, add a little salt, white pepper, and mustard, and a quarter-pound grated cheese. Stir in a tablespoonful vinegar, spread on bread with lettuce leaf, and lay on rings of egg-white.

Scrambled Egg Sandwich.

Scramble eggs in the usual way, then break up with a fork and add a very little mayonnaise or enough melted butter to make of spreading consistency. Use on white bread.

Chutney Sandwich.

Toast squares of crustless bread on one side. Butter untoasted side and spread half the slices with chutney or chilli sauce. Cover with a second slice of toast and serve.

CHEESE ON THE MENU.

Milk is a perfect food except for one drawback. It is highly perishable. Not so cheese.

This nutritious food conserves a considerable amount of the proteins, fats, minerals, and vitamins contained in milk, and, moreover, it has one marked advantage—its keeping quality. Nor is it more expensive. Far from being a luxury, cheese is really an economy, since it has been calculated that a pound of cheese is equal in food value to three quarts of milk.

In spite of these obvious advantages, the fact is Australians eat very little cheese. In this way they neglect a very valuable and tasty food.

Cheese is not an ordinary food, because the various blends and degrees of ripening or maturity provide an infinite variety of flavours and textures. While the taste for many of the fancy cheeses requires the palate of a connoisseur, for every-day use Cheddar cheese has an agreeable and delicate flavour that, in either mild or fully matured form, gives a balance and a refreshment to any meal.

Processed cheese is a modern addition to the wide range of textures and flavours, which this valuable food has to offer. Processed cheese combines the smooth, even texture of mild cheese with the delicate flavour of the matured varieties.

By skilful blending a uniform product is obtained, which is emulsified, pasteurised, and packed in tinfoil for convenience of distribution and serving.

It is in the partnership of cheese with the other foundation foods that the true taste value of each can be heightened and varied. In a lettuce salad, with fresh fruit, or with egg, cheese is the chief resource of the craftswoman, who wishes her servings to be "different."

Cheese combines most effectively with apples and celery. In a vegetable salad, the artistry of natural colour combination can be manifested in the bright green of the lettuce, the ruddy hues of the tomato, the white and yellow of the egg, and the old gold of Cheddar cheese.

Squares of cheese mounted on coloured toothpicks are an attractive savoury at any meal or entertainment, while a jar of grated cheese can be used to heighten the flavour of the breakfast, scrambled egg, or luncheon sandwich filling.

Cheese, well masticated, is as digestible as milk, and there are many nutritional reasons for including it in the daily diet of young children.

Hot Stuffed Eggs with Cheese.

Two hard-boiled eggs, 2 teaspoons grated cheese, salt, cayenne, about 2 cups white sauce. Cut eggs in half. Remove yolks and mash finely. Add seasonings and grated cheese and about 1 tablespoon of sauce or the same of cream. Stuff the eggs with the mixture. Put in greased fire-proof baking dish. Pour white sauce over and heat thoroughly.

GIVING FLIES THE BLUE.

We all know what a pest the common house fly is in summer—a creature of filth and a conveyor of filth and disease.

Very satisfactory results for the control of flies in glazed buildings have been obtained in Latvia by coating the inner surface of all glass in the building with a paste of moderate consistency made from whiting and coloured with methylene blue. Experiments showed that the effects of mid-shades of blue on the fly may be described as similar to snow-blindness. Daubing with a sponge was found the best way of applying the paste.

Tree Heritage.

Following is an extract from an article by "Waratah" in "The Sydney Morning Herald":—

TO-DAY is the day of the tree. In garden, park, along sidewalk or open country, it is our one great relief against growing piles of masonry and cold, cheerless cement roads.

A tree is the emblem of Nature's greatest handiwork, a giver of shade and restfulness, a softening influence on our lives, and the insignia of all beauty-lovers.

No suburb, town, or landscape is complete without its planted trees. A treeless area is drab and uninteresting. According to the number, selection, and care of its gardens and trees in a settlement, it is almost possible to assess accurately the aesthetic and cultural tastes of the residents.

Trees and shrubs are companions to grow up with. Their association during our earlier years becomes a landmark on our memory. How many of us can forget that childhood's picture of the trees we climbed and sheltered under, and how much they formed a part of our home-ties!

These are sufficient reasons to support my plea for the trees.

It is idle to say there is no room for a tree in a small area. Some of the best trees I know are growing almost at street level, and adjacent to the house. Glorious trees, these are giving wonderful shade in summer, and, dropping their leaves early, allow winter sunlight full play! What more could we desire than that?

That is the essence of value in tree planting—placing them to the best advantage. Nature has generously provided varieties to stand up against strong winds—comely and decorative even these. Others are for shade and avenue purposes—dignified and spreading—while still others are for the essential use of specimens in lawn or border. There are trees with beautiful flowers—as the jacaranda and Cape chestnut; trees with glorious autumn tints, and splendid trees such as our noble gums—straight and clean of trunk, beautifully marked and with splendid shining branches, disdainfully thrown out, but making harmonious pictures. To me there is nothing more majestic—nothing more complete and restful than the gums. . . . . There is something uplifting about these trees, and it is a tonic and a joy to live among them. All along the sightline, these blue gums spread their regal heads, and yet we never tire of them. Pity the day when they are cut down to make way for "progress"!

Every building allotment should preserve its quota of trees to retain this standing beauty and irreplaceable heritage. Every home builder should see that some at least of the trees on his holding are preserved for his district and his own soul-satisfaction. It is the only way.

There is a small cleared and tree-bordered square near Pennant Hills that is almost hallowed ground. It must have been a fine old place that graced the area in days gone by—I have not yet heard the story—as a fine grouping of trees remains to testify. English oaks are here, and elms, cypresses, and brush box—even Chinese weeping elms. Those trees always hold a touch of romance.

Across the way there is a reserve of blue gums, noble and picturesque —incomparable in their setting.

A friend just back from Redcliffs, near Mildura (on the Murray), where the summers are sizzling, tells me of the avenues, or belts, of trees (white cedars and others) bordering the allotments. They are gratefully accepted for shade by travellers and workers. In season, they are beautiful in flower. Without those trees the going would be much harder.

Albury has its avenues of kurrajongs and other lovely species. Almost every home holding has its trees. Bathurst is planted with a specific variety—all lovely decoratives—in almost every street. Home gardens have beautiful trees. They are the greatest charm of this "City of the Plains."

In coastal country, jacarandas and Cape chestnuts take pride of place as flowering trees. The Flame Tree (*Brachychiton acerifolia*) gives us a blaze of glory to remember, but it is a variable doer in regard to flowering. Bauhinias are wonder trees when in full bloom—a mass of purple or white. They have the additional virtue of not growing too big. All soils suit them, but a warm situation is best.

Silky oaks, grown properly in a good soil, are grand—brilliant in flower. The Queensland chestnut (*Castanospermum australis*) similarly treated is one of the noblest decoratives we have.

Then there is a yellow-flowered cousin of the Pittosporum—*Hymenospermum flavum*—a small tree, and a fitting companion to the Bauhinias for restricted gardens.

Keep the camphor laurels away from tiny areas and garden beds. Their work is for colour making on a grand scale.

Magnolias are full of grandeur. The large white flowered "Bull-Bay" tree is still sporting a flower in odd places.

Where the site is warm and sheltered, and the soil deep, free, and moist (not badly drained), the "Fire" or "Wheel" tree (Stenocarpus) is a picture tree, graceful and shapely, and rich with blooms of fiery scarlet. With these conditions, it grows into a big tree.

Here, also, grow the Queensland lemon-scented gum (*Eucalyptus citriodora*), a poem of tree beauty—supple, and delicate as a wisp. It is our daintiest tall tree. Not for the dry hills and wind-swept positions are these two. Many of the kurrajong hybrids will stand up to hard going, and they are trees of great decorative value. . . . . All are evergreens in the truest sense. . . . .

EASY SCRUB FEEDING.

Thoughtless men cut down useful fodder trees; others merely lop off the top branches. Both ways are wasteful, and regrowth is a matter of months, or even years. The most economical method is to flail the leaves off. By stripping the foliage in this way, the twigs remain to make new growth within a few weeks, when the process can be repeated.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1939 AND 1938, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Sept.	No. of years' records.	Sept., 1939.	Sept., 1938.
North Coast.	In.		In.	In.
Atherton	0·74	38	0·41	0·95
Cairns	1·67	57	0·58	0·81
Cardwell	1·52	67	0·28	0·94
Cooktown ..	0·56	63	0·30	0·13
Herberton ..	0·55	53	..	0·35
Ingham	1·58	47	0·05	0·90
Innisfail	3·51	58	3·69	3·00
Mossman Mill ..	1·67	26	0·91	0·47
Townsville ..	0·75	68	..	..
Central Coast.				
Ayr	1·29	52	..	..
Bowen	0·79	68	..	0·07
Charters Towers ..	0·78	57	..	..
Mackay P.O. ..	1·53	68	0·34	0·14
Mackay Sugar Experiment Station	1·44	42	..	0·18
Proserpine ..	2·04	36	0·38	0·84
St. Lawrence ..	1·24	68	..	0·16
South Coast.				
Biggenden ..	1·50	40	..	0·13
Bundaberg ..	1·55	56	0·11	0·31
Brisbane	1·99	87	0·45	0·99
Caboolture ..	1·80	52	..	0·39
Childers	1·75	44	..	0·32
Crohamhurst ..	2·59	46	0·35	0·83
Esk	2·06	52	0·27	0·63
South Coast—contd.	In.		In.	In.
Gatton College ..	1·53	40	..	0·86
Gayndah	1·54	68	0·05	0·10
Gympie	2·10	69	0·06	1·66
Kilkivan	1·67	60	..	0·11
Maryborough ..	1·91	68	0·16	0·68
Nambour	2·44	43	0·50	0·86
Nanango	1·80	57	0·16	0·95
Rockhampton ..	1·28	68	..	0·01
Woodford ..	2·12	52	0·42	0·95
Central Highlands.				
Clermont ..	0·99	68	..	0·02
Gindie	1·03	40	..	0·27
Springsure ..	1·29	70	..	0·63
Darling Downs.				
Dalby	1·66	69	0·01	0·56
Emu Vale ..	1·74	43	0·54	0·95
Hermitage ..	1·54	33	..	0·94
Jimbour	1·45	51	..	0·37
Miles	1·33	54	0·07	0·96
Stanthorpe ..	2·27	66	1·17	2·18
Toowoomba ..	2·09	67	0·14	0·58
Warwick	1·81	74	0·48	1·41
Maranoa.				
Bungeworgorai ..	0·94	25	..	0·15
Roma	1·39	65	..	0·58

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—SEPTEMBER, 1939.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·02	81	66	96	28	55	29	30	4
Herberton	..	75	50	85	27	39	4, 29, 30	..	..
Rockhampton	30·11	79	54	91	21	45	4	..	..
Brisbane	30·14	74	51	84	21	44	13	45	3
Darling Downs.									
Dalby	30·14	74	41	82	26	27	13	1	1
Stanthorpe	..	67	33	77	26	21	13	117	4
Toowoomba	..	71	42	79	10	30	13	14	2
Mid-Interior.									
Georgetown	30·03	88	55	92	21, 22, 23, 27	41	5	..	..
Longreach	30·11	82	49	92	26	35	5	..	..
Mitchell	30·13	75	39	88	26	28	13	..	..
Western.									
Burketown	30·04	86	61	95	28	49	4	..	..
Boulia	30·11	83	53	94	25, 26	42	1	..	..
Thargomindah ..	30·13	78	47	90	25	39	5	..	..

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	November, 1939.		December, 1939.		MOONRISE. Nov., 1939.	MOONRISE. Dec., 1939.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	5·3	6·9	4·50	6·31	9·49	10·17
2	5·2	6·10	4·50	6·30	10·45	11·1
3	5·1	6·11	4·50	6·30	11·34	11·45
4	5·0	6·12	4·50	6·33	..	..
					a.m.	a.m.
5	5·0	6·12	4·50	6·34	12·17	12·27
6	4·59	6·13	4·50	6·34	1·0	1·8
7	4·58	6·14	4·51	6·35	1·45	1·49
8	4·58	6·14	4·51	6·36	2·26	2·33
9	4·57	6·15	4·51	6·37	3·9	3·19
10	4·56	6·16	4·51	6·38	3·52	4·7
11	4·56	6·17	4·51	6·38	4·39	4·59
12	4·55	6·18	4·52	6·39	5·28	5·52
13	4·54	6·18	4·52	6·40	6·18	6·45
14	4·54	6·19	4·52	6·40	7·10	7·41
15	4·53	6·20	4·52	6·41	8·4	8·34
16	4·53	6·21	4·53	6·41	8·58	9·27
17	4·53	6·22	4·53	6·42	9·52	10·17
18	4·52	6·23	4·53	6·42	10·34	11·8
19	4·52	6·23	4·54	6·43	11·36	11·58
					p.m.	p.m.
20	4·52	6·24	4·54	6·44	12·26	12·49
21	4·51	6·25	4·54	6·44	1·18	1·41
22	4·51	6·25	4·55	6·45	2·7	2·35
23	4·51	6·26	4·55	6·45	3·0	3 32
24	4·50	6·27	4·56	6·46	3·54	4·29
25	4·50	6·28	4·56	6·47	4·49	5·27
26	4·50	6·28	4·56	6·47	5·47	6·25
27	4·50	6·29	4·57	6·48	6·45	7·19
28	4·49	6·30	4·58	6·48	7·44	8·11
29	4·49	6·30	4·58	6·49	8·38	8·59
30	4·49	6·31	4·59	6·49	9·30	9·44
31			5·0	6·50		10·26

Phases of the Moon, Occultations, &c.

4th Nov. ☾ Last Quarter 11 12 p.m.
11th „ ● New Moon 5 54 p.m.
19th „ ☽ First Quarter 9 21 a.m.
27th „ ○ Full Moon 7 54 a.m.

Perigee, 8th November, at 7.0 a.m.
Apogee, 20th November, at 5.0 a.m.

At 10 p.m. on the 19th Mars will be 6 deg. south of the Moon at first quarter. The Moon will set near midnight, and Mars about 50 minutes earlier.

On the 21st the Moon will accompany Jupiter. When darkness falls both will have crossed the meridian.

Saturn and the Moon will travel together across the sky from 3.54 p.m. on the 24th to 2.44 a.m. on the 25th, Saturn rising 20 minutes earlier and setting half an hour later than the Moon. When the planet is on the meridian—about 9.30 p.m.—the Great Square will be seen to the north-west of it.

Mercury will be a morning star at the beginning of December, and on the 17th attain its greatest distance—21 deg. west of the Sun.

When twilight fades on 13th December Venus will be seen in conjunction with a fine crescent of the Moon above the western horizon. Both will set at the same time—about 8.30 p.m.

Mercury rises at 6.11 a.m., 1 hour 8 minutes after the Sun, and sets at 7.53 p.m., 1 hour 44 minutes after it, on the 1st; on the 15th it rises at 6.7 a.m., 1 hour 14 minutes after the Sun, and sets at 8.2 p.m., 1 hour 42 minutes after it.

Venus rises at 5.53 a.m., 50 minutes after the Sun, and sets at 7.17 p.m., 1 hour 8 minutes after it, on the 1st; on the 15th it rises at 5.59 a.m., 1 hour 6 minutes after the Sun, and sets at 7.44 p.m., 1 hour 24 minutes after it.

Mars rises at 12.3 p.m. on the 1st, and sets at 1.21 a.m. on the 2nd; on the 15th it rises at 11.45 p.m., and sets at 12.54 a.m. on the 16th.

Jupiter rises at 3.11 p.m. on the 1st, and sets at 3.23 a.m. on the 2nd; on the 15th it rises at 2.10 p.m., and sets at 2.27 a.m. on the 16th.

Saturn rises at 5.16 p.m. on the 1st, and sets at 4.42 a.m. on the 2nd; on the 15th it rises at 4.13 p.m., and sets at 3.46 a.m. on the 16th.

4th Dec. ☾ Last Quarter 6 40 a.m.
11th „ ● New Moon 7 45 a.m.
19th „ ☽ First Quarter 7 4 a.m.
26th „ ○ Full Moon 9 28 p.m.

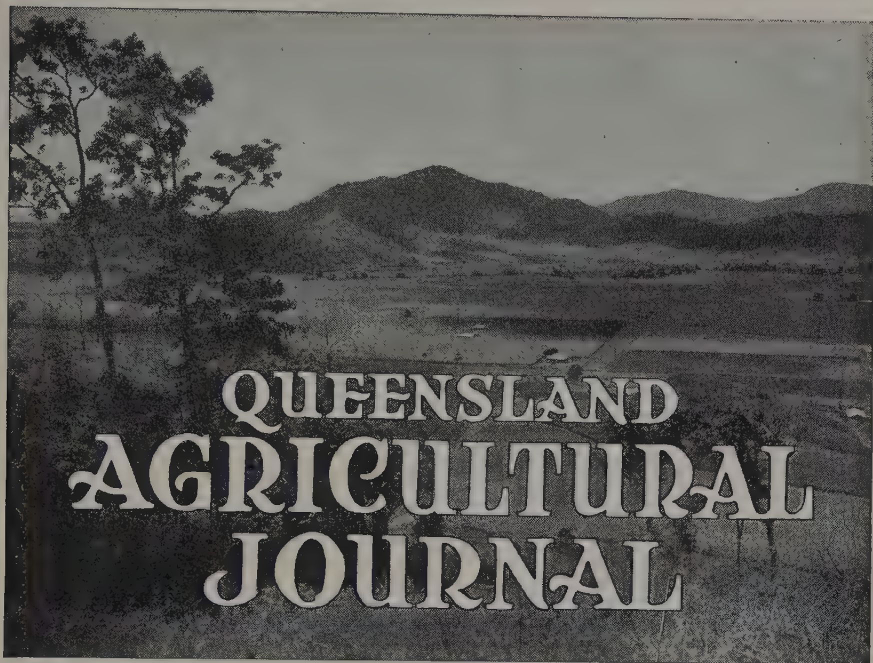
Perigee, 3rd December, at 5.0 p.m.
Apogee, 18th December, at 2.0 a.m.
Perigee, 29th December, at 9.0 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.



Vol. LII. 1 DECEMBER, 1939 Part 6

Event and Comment

A Year of Record Production.

IN his annual report to the Minister, Hon. Frank W. Bulcock, the Under Secretary of the Department of Agriculture and Stock, Mr. R. P. M. Short, has presented a comprehensive review of the conditions of primary industry throughout the State, from which the following salient points have been taken:—

The statistical position of the pastoral industries reveals an increase in all classes of livestock. Of the total meat exports from Australia, Queensland contributed 51·84 per cent.

The immediate outlook for the beef industry is bright, but the Department has urged a continuance of effort to improve the quality of meat products so that, whatever may be the outcome of the present international situation, Queensland meat exports will hold a good position in markets abroad.

Animal health services have been well maintained, and the work of the stations at Yeerongpilly and Oonoonba has been co-ordinated.

It has been shown that introduced pastures on tropical coastal lands will not only fatten stock, but also will produce prime beef—approximately 80 per cent. being graded (most of it actually exported) as first-grade chilled beef. Because of the fact that these pastures can be maintained in the green state throughout the year, it is possible to so arrange grazing that cattle can be turned off in any particular month.

Animal dietetic and bio-chemical work formed an important section of the animal health work. In a broad programme of investigation,

problems of sufficient economic importance to merit systematic exploration were studied.

As a result of the good season, an increase in lambing percentages is expected.

The importance of flock improvement has been stressed, and the classing of breeding stock also has been a salient point in departmental instruction. Practical demonstrations on other points in flock management were also given as a regular instructional service.

Fat lamb production has increased as an outcome of the assistance given to the industry by the introduction of suitable breeding stock from the Southern States and New Zealand. The most satisfactory experience of the year was a definite improvement in type as well as an increase in the number marketed.

A series of drought-feeding trials has been designed under conditions representing serious seasonal adversity.

A substantial increase in inquiries indicates that producers are appreciative of the benefits of sound stock-feeding practice.

The yield of raw sugar in Queensland for the 1938 season constituted a further record, exceeding the previous highest (that of 1937) by some 13,000 tons.

Seasonal conditions were such that plump grain was a characteristic of every wheat crop, and the harvest was exceptionally heavy. The estimated production of 8,500,000 bushels from 450,000 acres is more than 3,000,000 bushels in excess of the previous record harvest from 272,316 acres in 1930-31.

Breeding, selection, and observation plots produced satisfactory results at several locations in the Darling Downs and Maranoa districts. Varietal trials in the Callide and Dawson Valleys were similarly successful.

Early maize crops were unprofitable for grain in most districts. Good average returns were obtained from the late-sown crop. Pure seed maize improvement work was continued in the Mary Valley, Murgon, Lowood, and Kilcoy districts.

Returns from barley, oat, and canary seed crops were influenced by the favourable season on the Darling Downs, but increases in acreage and production were disproportionate as compared with wheat.

A reduction in both the number of cotton-growers and acreage has to be reported. This decline, however, is considered to be only temporary.

Grain sorghum cultivation is gaining rapidly in importance, particularly on the Darling Downs and in districts where maize often fails as a grain crop.

It is many years since such large quantities of summer fodder crops were produced. A substantial proportion of the surplus has been converted into silage for winter feeding and as a dry-time reserve.

Some increase in the conservation of hay as well as silage has been observed.

Tobacco auction values were well maintained at approximately the previous year's rates. The demand continues keen for all grades of bright leaf.

Good yields and high average prices were the experiences of potato-growers.

Peanut-growers also had a good year, yield and quality being satisfactory throughout.

Both winter and summer fodder crops were produced in abundance. In conservation practice, a remarkable advance was made on the Atherton Tableland, where, with the assistance of the Bureau of Rural Development, forty-four new pit silos of the concrete collar type were constructed and filled during the autumn months.

The number of silos of different types constructed in Queensland during the year exceeded greatly the number built in any previous year.

Interest in pasture management is extending in every dairying district, and has resulted in a strengthening demand for seed and rootlets from the departmental grass propagation plots.

New district offices of the Department have been established at Bundaberg, Monto, Gympie, and Kingaroy.

Satisfactory conditions prevailed generally throughout the fruit-growing districts.

The research activities of the Department have continued to expand.

Agricultural investigation comprised work on various problems associated with field crops. Other investigations covered the control of plant diseases and pests, the identification and study of plants reputedly poisonous to stock, pasture problems, and soil bacteriology. Very promising results have been achieved in many fields and much important data have been recorded.

By the end of the year dairy production had attained the highest level ever recorded in Queensland.

The drive for quality improvement in cheese has led to much activity in the rebuilding or remodelling of factory premises.

The approximate value of the dairy industry to Queensland for the year was £10½ millions.

To provide supplements to the ordinary pastures, fodder conservation in stack and silo is becoming more widely practised in the dairying districts. Instructional and advisory effort has been directed towards making this form of provision for dry seasons a routine practice on every farm. The attainment of an equilibrium between crop production and fodder provision is another objective.

In addition to building up fodder reserves, farmers are giving more attention to the nutritional aspects of animal husbandry. The fact that proper nutrition is a factor of first importance in any stock improvement scheme is becoming more broadly appreciated; likewise, the fact that the level of nutrition determines the level and degree of that improvement.

Fodder provision and pasture improvement are, therefore, regarded as cardinal points in departmental policy.

Accelerated progress was the general experience in the pig industry during the year. Prices were maintained on a more satisfactory and stable basis.

Better farm practice has resulted in healthier stock; and there has been a steady improvement in the quality of pork and bacon pigs marketed either as feeders or breeders. The export trade in pig products has expanded considerably.

Expansion also marked the year in the poultry industry, and increased production has been the experience throughout the State.

The year was, generally, the most productive in the history of Queensland.

Pineapple Culture in Queensland.

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Chapter I.—HISTORY AND ECONOMIC IMPORTANCE.

INTRODUCTION.

THE pineapple is a native of South America. While its original habitat is generally believed to have been the dry, upland forest country in the hinterland of Brazil, evidence exists that it was introduced there from Paraguay by tribes of conquering Indians. Historical records indicate that the pineapple was first brought to the attention of western civilisation by Christopher Columbus and his companions, who found the plant growing on the island of Guadelope, in the West Indies. Repeated references to the highly palatable qualities of this "strange new fruit, shaped like a pine cone," were made by subsequent explorers of the New World, and before the end of the sixteenth century the pineapple had become widely established in tropical countries through the agency of Spanish and Portuguese missionaries and navigators. Its introduction into India has been traced back to 1548. So favourable for its growth were the conditions in this and other countries to which it was introduced that it quickly escaped from cultivation and grew wild, notably in the Philippines, Formosa, and the Hawaiian Islands.

During the latter half of last century, the production of pineapples under shadehouse conditions became one of the principal industries of the Azores, and these islands now supply most of the fresh pineapples sold in European countries. South Africa also sends a small quantity of fresh pineapples to the London market, but the development of this trade has been hampered through want of a satisfactory method of storing the fruit over the period required for its transportation to Great Britain. Experimental shipments of fresh pineapples from Queensland to England have failed for the same reason.

About thirty years ago, Florida annually contributed more than a million cases of pineapples to United States markets, but to-day the American trade draws its supplies of fresh pineapples chiefly from the West Indies. In addition, the Hawaiian Islands ship small quantities to ports on the Californian coast.

Little trade in fresh pineapples takes place to or from other countries, more than 90 per cent. of the world's production at the present time being utilised for canning purposes. In a little more than forty years, pineapple-canning has become one of the important food-preserving industries of the world, and it now ranks as the second biggest fruit-canning industry, the gross value of the product being exceeded only by that of canned peaches.

Uncertainty exists as to the country in which pineapple-canning was first carried out. It is known, however, that a cannery was operating in Malaya in 1895, and that two years before this efforts were being made to establish the industry in Hawaii. Between them these two countries now produce about 85 per cent. of the world supply of

16,000,000 cases annually, the Hawaiian Islands alone contributing around 70 per cent. The remainder is produced by Formosa (11 per cent.), Queensland (2 per cent.), other countries (2 per cent.).

HISTORY OF THE PINEAPPLE INDUSTRY IN QUEENSLAND.

Nearly twenty years before Queensland was proclaimed a State, pineapples were being cultivated around Brisbane, and the Smooth Cayenne variety, long regarded as being pre-eminent for canning purposes, was grown in Queensland for nearly fifty years before it was first introduced into Hawaii. In fact, Queensland was one of the countries from which the Hawaiian industry drew its original supplies of Smooth Cayenne planting material.

The history of the introduction of the pineapple into Queensland is somewhat obscure. Early records indicate, however, that the first plants were probably brought from India about 1838 by Mr. Hand, a German missionary, but pineapples are said to have been grown near Sydney, New South Wales, as far back as 1824. It is recorded that Mr. Hand propagated pineapple plants in Brisbane on a site near the existing Treasury Buildings, and when he left Brisbane—a few years later—he gave them to Mr. T. C. Wagner, of the German Mission Station at Nundah, on the outskirts of the city. From this mission station planting material was subsequently distributed amongst the

Plate 258.

A PINEAPPLE FIELD AT NUDGEE, NEAR BRISBANE, which has been fruiting continuously for more than fifty years without replanting. In this old-established field the Smooth Cayenne and Queen varieties occur mixed together in the same rows.

neighbouring settlers. In 1903—sixty years later—one of Mr. Wagner's original plantings was still in existence at Nundah, at which time it was reported to have been "healthy and strong." Several very old plantations are still under cultivation in the Brisbane area. Plate 258 shows a portion of a plantation at Nudgee which was planted more than fifty years ago.

From the original plantations at Nundah pineapple cultivation soon extended to other farming centres in the vicinity of Brisbane. As the early settlers had to rely solely on horse-drawn conveyances for the marketing of their perishable produce, proximity to centres of population was one of the chief factors determining the location of pineapple plantations in Queensland until late in the last century. Consequently, for nearly sixty years the industry remained centred close to Brisbane. The development of railway and other transport facilities provided access to other markets, however, particularly the capitals of the Southern States. To meet the increasing demand which followed the opening-up of these markets, extensive plantings of pineapples were made in the coastal districts north of Brisbane, particularly in the vicinity of Woombye. At the same time, small areas were planted to meet local requirements in various other coastal localities all the way from Port Macquarie (in New South Wales) to Cooktown (in North Queensland)—a range of latitude extending over 1,100 miles. Thus, the initial development of the pineapple industry in Queensland took place in response to

Plate 259.

A PINEAPPLE FIELD TRIAL AT BOWEN, NORTH QUEENSLAND, FOURTEEN MONTHS AFTER PLANTING.—The land on which this trial is located has been under cultivation for twenty-six years.

a demand for the fruit in a fresh condition, and it was not until production began to exceed this demand that serious attention was given to the development of a canning industry.

For many years the production of pineapples expressly for canning purposes was regarded as being uneconomic, and only during glut periods was fruit available for this purpose. In consequence, pineapple-canning was first taken up as a subsidiary to jam and sauce manufacture by factories located in Brisbane. From 1920 onwards, however, there was a very sharp rise in production, due largely to extensive plantings which had been made in soldier settlement areas in Southern Queensland, and, to absorb the surplus fruit from these areas, the Queensland State Government erected a modernly-equipped cannery in Brisbane. This cannery was subsequently taken over by private enterprise, and it still handles the bulk of the pineapples canned in Queensland. Because of the fact that all of the existing canneries are located in Brisbane, the great bulk of the pineapples now canned in Queensland are drawn from the narrow strip of coastal country which extends from Brisbane (in the South) to Gympie (in the North)—a distance of about 100 miles. Recently, however, increasing attention has been given to pineapple-growing in several coastal districts in the northern part of the State—notably around Ayr, Bowen, and Rockhampton (Plate 259). The growth of the pineapple-canning industry in Queensland since 1929 is illustrated by the following production figures, expressed both in 1½-bushel cases and in tons:—

——	Canneries.		Fresh-fruit Markets.		Total.	
	Cases.	Tons.	Cases.	Tons.	Cases.	Tons.
1929	210,300	5,258	355,246	8,881	565,546	14,139
1930	297,630	7,441	338,016	8,450	635,686	15,891
1931	222,642	5,566	502,461	12,560	725,103	18,126
1932	298,107	7,453	460,326	11,508	758,433	18,961
1933	387,083	9,677	474,339	11,859	861,422	21,536
1934	321,233	8,031	468,056	11,701	789,289	19,732
1935	369,220	9,230	460,966	11,524	830,186	20,774
1936	418,033	10,451	389,931	9,748	807,964	20,199
1937	358,535	8,963	415,794	10,395	774,329	19,358
1938	689,350	17,234	627,826	15,696	1,317,176	32,930

While there has been a marked increase in the total annual production during the past ten years, a greater proportion of this increase has been absorbed by the canneries than by the fresh-fruit markets. The increased production has resulted from several causes, but partly it is attributable to a lowering of production costs through increases in the average acreage yield.

Between 1932 and 1938 the average yield per bearing acre rose from 5·4 to 9·3 tons—an increase of 72 per cent. Among the factors responsible for this yield increase are: (1) Closer spacing of the plants, giving increased plant populations; (2) more efficient fertilizing practices; and (3) reduced losses from diseases.

BASIS ON WHICH THE QUEENSLAND PINEAPPLE INDUSTRY IS ORGANISED.

In most countries where pineapple-canning ranks as an important industry the crop is grown either by the canners themselves (Hawaii and the Philippines)—in which case large-scale methods of production are employed—or by a system of tenant farming whereby the canneries or large estates lease small areas of land to individual growers. The latter system has long been in vogue in Malaya, and has recently been adopted in Fiji. In Queensland, however, production has always been carried on solely by small independent landholders. Individual plantations vary in size up to a maximum of 50 acres, but where the cultivation of this crop provides the sole source of income the planted area averages from 8 to 10 acres. Apart from the consideration of finance, the economic limit to which any single plantation may be extended varies with the locality, since the supply of casual labour required for planting, weeding, and harvesting the crop is subject to considerable fluctuation in certain districts. In general, however, individual plantations rarely exceed 20 acres in extent.

Since the basic production unit of the Queensland pineapple industry is a small holding on which the owner carries out most of the cultural operations himself, it is not practicable to utilise mechanical aids to the same extent as they are employed on the large-scale plantations in Hawaii. Consequently, it has been necessary to devise cultivation practices especially suited to local requirements. In some cases these have been adapted from the accumulated experience of other countries, particularly Hawaii, but many have been worked out especially for Queensland conditions.

Chapter II.—GENERAL CHARACTERISTICS OF THE PINEAPPLE.

BOTANICAL RELATIONSHIPS.

The pineapple belongs to a family of plants known as the *Bromeliaceæ.* This plant family is indigenous to tropical America and the West Indies, and includes 850 species or representatives, of which the pineapple is the only one of any economic importance. Most of the plants belonging to the *Bromeliaceæ* are epiphytes—that is, plants which cling to others for support without deriving nourishment from them—but a number of species in this family are terrestrial in habit, included among which is the pineapple. Although the pineapple is a terrestrial plant, its epiphytic relationships are indicated by its ability to remain alive for months without contact with the soil. This attribute not only allows planting material to be transported over long distances, but also makes it possible for autumn-plucked slips to be stored for planting in the following spring. A curious epiphytic representative of the botanical family to which the pineapple belongs is the so-called Spanish moss, *Tillandsia usneoides* L., which festoons trees in the sub-tropical regions of the south-eastern United States (Plate 260).

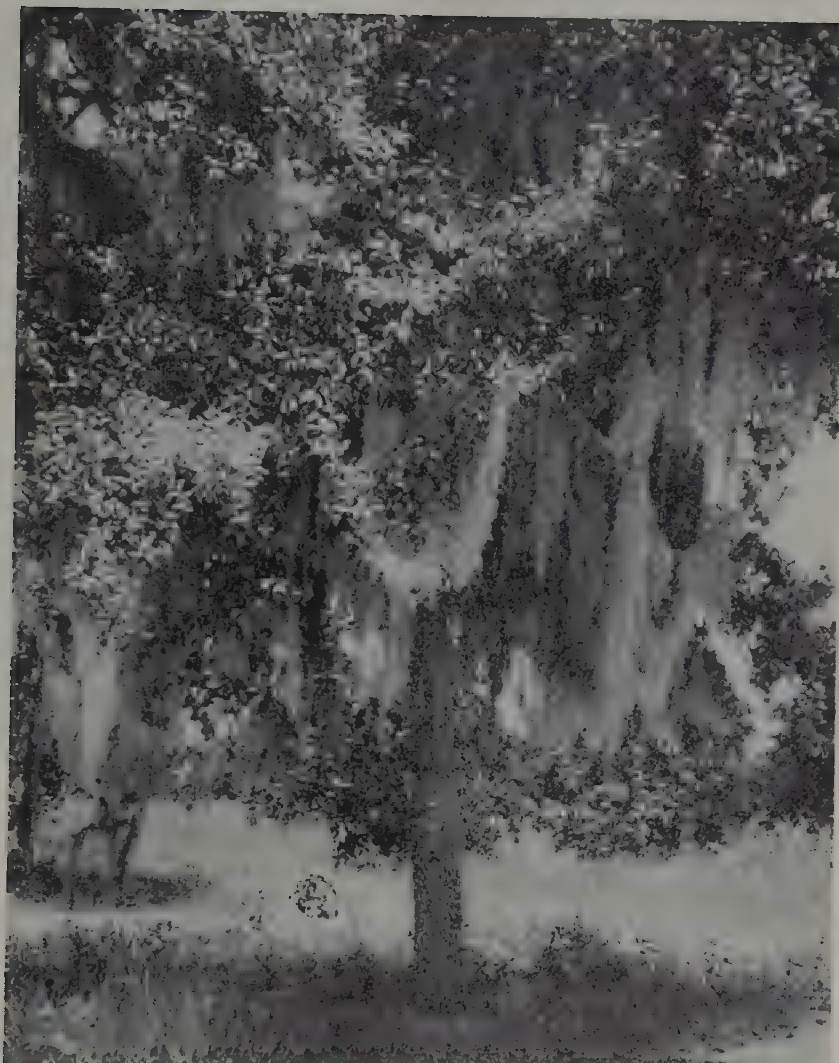

Plate 260.

Spanish Moss, *Tillandsia usneoides* L., an Epiphytic Plant belonging to the same Botanical Family as the Pineapple, which grows on trees in the sub-tropical regions of the south-eastern United States.

All of the cultivated varieties of the pineapple belong to the species *Ananas sativus* (Lindl.), but the progenitor or ancestor of this species appears to have been the grasslike, wild Brazilian pineapple *Ananas michrostachys* (Lindl.) (Plate 261). During the centuries that it has been

Plate 261.

A PRIMITIVE PINEAPPLE NATIVE TO BRAZIL.—*Ananas michrostachys* (Lindl.), which is probably a progenitor of the cultivated species *Ananas sativus* (Lindl.).

under cultivation, the size and edible qualities of the pineapple fruit have been greatly improved, and anyone lacking the requisite botanical knowledge would not readily perceive the relationship which exists between the present-day varieties of commerce and their wild progenitors.

Like many plants with epiphytic relationships, the pineapple is adapted to a xerophytic habit of growth—i.e., its anatomical structure enables it to live and reproduce itself under relatively arid conditions—and its original habitat was probably a dry upland forest.

THE PLANT STRUCTURE AND ITS FUNCTIONS.

The pineapple plant (Plate 262) consists essentially of a short, stout stem with a restricted but dense root system arising from the leaf axils at its base, and with fleshy, narrow, stiff, troughlike leaves radiating spirally from the aerial portion. The plant normally attains a height of from 2 to 4 feet—depending on the variety and on the conditions of growth. About a year after planting, a flower bud forms in the apex of the stem and protrudes on a short, thick stalk, to develop into the fruit.

Plate 262.

A Plant of the Smooth Cayenne Variety with the Leaves cut away to show the Various Plant Parts—viz., (1) roots; (2) stem; (3) fruit; (4) top or crown; (5) ground sucker; (6) sucker; (7) slip.

Only one fruit is produced from each stem. Succeeding crops are produced by shoots which develop from near the base of a fruiting plant, either above or below ground level. These shoots are commonly known as "suckers." Offshoots may also develop from the fruit stalk proper. These latter shoots are known as "slips," to distinguish them from suckers, from which they differ in several respects, but chiefly in that

each is attached to a primitive or abortive fruit which forms a basal knob. The fruits of cultivated varieties are normally seedless, but both suckers and slips, as well as the shoots which develop from the tops of the fruit—namely, the crowns—provide vegetative organs from which the pineapple may be commercially propagated.

The Stem.

The stem serves both as a support for the leaves and fruit and as a connecting link between the roots and the aerial portions of the plant. It develops from the core of the shoot used for planting. Growth of the plant is accompanied by a lengthening and broadening of the stem. The extent to which the stem may elongate is determined, not only by hereditary influences, but also by environmental and nutritional factors. A long-stemmed plant is undesirable, because it is usually high suckering, with the result that, in the ratoon crops, fruits fall over into the inter-row spaces and may be wasted. The stems of low-set plants are almost completely enveloped by the leaves, so that they are apparently stemless. In addition to its other functions, the stem of the pineapple plant also serves as a storehouse for starch; after the fruit is harvested, starch accumulates in the stem to a very marked degree. It is from these starch reserves in the parent stem that sucker offshoots derive much of their nourishment during their early stages of growth.

The Roots.

The root system of a terrestrial plant constitutes the mechanism (1) whereby it obtains anchorage in the soil and (2) through which it absorbs the greater part of its supply of water and mineral nutrients. In addition to their role as absorptive organs, however, roots also function in the assimilation of certain plant foods, particularly nitrogen. An inadequate or damaged root system is reflected in a stunting or wilting of the aerial parts of a plant, especially the leaves. In Queensland, crop failures resulting from deranged or diseased roots are responsible for heavier losses to the pineapple industry than all other causes combined. Therefore, a proper appreciation of the role played by roots and the conditions necessary for their healthy development is a pre-requisite to success in pineapple culture.

Mode of Root Development.—The roots of the pineapple plant develop from buds in the leaf axils at the base of the stem. Under favourable conditions of moisture and temperature, roots will develop in this manner from any of the offshoots produced from a mature plant. Rooting is facilitated by stripping off the lower leaves of the shoots before planting. Unless this is done, the elongating roots may wind around the stem underneath the leaves without coming into contact with the soil. This condition, which is known as "tangleroot," is most prone to happen in the case of suckers because of the close manner in which the leaves of these shoots are appressed to the stem; it rarely occurs when plants are propagated from slips or crowns, both of which have a relatively open structure.

The development of adventitious roots in the axils of the lower leaves is a characteristic of the pineapple plant and differentiates it from most other crop plants. For a long time it was assumed that the axillary roots which develop in the leaf axils above ground level absorbed the water and nutrients which lodge in them, even in the embryonic stage, but investigation has partly disproved this view. It has been ascertained that an axillary root performs none of the normal

functions of a root until its tip grows out beyond the base of the leaf sheath which tightly encases it, because, in this region, the leaves are so closely appressed to the stem of the plant that water or nutrients in solution are unable to penetrate to the embryo roots.

The Spread of Roots in the Soil.—The pineapple is essentially a shallow-rooted plant and, in soils which favour its development, the spread of the roots is not very extensive. Most of the roots are concentrated in the first 6 inches of soil, and, while a few may attain a length of 3 feet or more, the bulk of them do not extend laterally for more than a foot from the base of the plant unless (*a*) the soil is compacted or otherwise poorly aerated, or (*b*) the plant is suffering from a deficiency of iron. Because of its limited root spread, the pineapple utilises fertilizers to best advantage when they are applied at or close to its base.

Conditions Influencing the Development of Roots and Root Hairs.—Under favourable conditions of temperature and moisture, soil-inhabiting roots are freely produced from the leaf axils at the base of the plant stem. Except at the extreme tips, they are covered throughout their length by a dense mat of root hairs. Development of root hairs begins almost immediately after the root bud has swelled and continues to follow the root cap for the life of the root. Absorption of water and mineral plant foods takes place chiefly through the root hairs. Consequently, the normal functioning of the plant is dependent on the development of a root system adequately supplied with root hairs, and the extent to which this requirement may be attained is determined by the soil environment. In fertile, well-aerated soils the roots branch freely, but they are comparatively short, thick, and fleshy, of considerable tensile strength, and densely covered with root hairs. In closely-compacted or waterlogged soils, however, or where the plants have been set at too great a depth, the roots which develop are few in number, brittle, spindly, and almost devoid of root hairs. Such roots may be from two or three times as long as those produced under more favourable conditions, but, despite the greater average length of the individual roots, their weight and volume is relatively small.

Provided moisture and temperature conditions in the soil are favourable, new roots are produced at frequent intervals throughout the life of the plant. In South-eastern Queensland, root development is almost entirely inhibited during the coldest period of the year—i.e., from the middle of June to the middle of August—but it is prolific in the warmer months, particularly during the rainy season. A growth rate of more than 3 inches per week has been noted for individual roots at this time.

Relationships between Roots and Leaves.—In the pineapple plant, the water and dissolved nutrients absorbed by any one root are not distributed freely throughout the entire plant body, since each root is connected with a particular leaf by means of a bundle of fibres which serve as conducting channels for the absorbed materials. Although a certain amount of diffusion takes place, most of the nutrient solution absorbed by any one root is supplied to a single leaf. The oldest roots—i.e., those at the extreme base of the plant—are connected with the oldest leaves, and a similar relationship exists for all other roots and leaves. Consequently, the slowing-down in the rate of new root production which occurs during the winter months is reflected in a corresponding curtailment of new leaf growth. Similarly, death of individual roots

results in the wilting and drying-out of the leaves which are dependent on them. In the event of a general failure of the root system, the supply of water and nutrients to the leaves is almost completely cut off and the entire plant collapses. This condition is commonly referred to as "wilt." General root failure in pineapple plants may arise from either parasitic or environmental causes, and these are discussed later in connection with diseases.

Ageing and Death of Roots.—Death of the oldest roots is a normal occurrence, and is not associated with the development of symptoms of disease or malnutrition. As old roots at the base of the stem die, new ones emerge from higher up to take their place in the same way as old leaves are replaced by new ones as soon as they have fulfilled their function. In fact, both the decay of old and the development of the new roots and leaves is interrelated. As pineapple roots become older, they take on a hard, brown, corky appearance and, although the internal tissues retain their healthy silver colour, old roots are not able to take up and transport as much water and nutrients as are younger and more strongly-growing ones, because death of the root proper is preceded by death of the root hairs. Normally, roots die as soon as they cease to function and, consequently, conditions which inhibit root activity are predisposing towards root decay. This explains why a large proportion of the roots of pineapple plants grown in South-eastern Queensland die during the cold winter months. Because loss of water through the leaves—i.e., transpiration—is slowed up very considerably by cold, cloudy conditions, relatively heavy root failure has little or no perceptible effect on the health of the plant at this time. Should the cold winter months be followed by a prolonged period of dry weather in the spring, however, the inability of the depleted root system to maintain a flow of water to the leaves in excess of that lost by transpiration—the rate of which has been accelerated by the rising seasonal temperatures—will result in a general loss of colour and turgor from the leaves, accompanied by dying-back at the tips and, where soil conditions are highly unfavourable, may give rise to the developments of characteristic wilt symptoms.

The Leaves.

In all green plants the leaves perform the function of synthesising starches and related energy-providing and tissue-building substances by combining carbon dioxide gas obtained from the air with water absorbed by the roots. This is effected in the chlorophyll—the green colouring matter of the leaves—through the agency of sunlight. On the efficiency with which the leaves carry out their photosynthetic function depends both the vigour and the productivity of the plant as a whole.

General Characteristics.—The leaf of the pineapple plant is typically long and narrow and tapered to a point at the tip. The edges are both curved upwards. Thus the leaf is a troughlike structure, and as such it is peculiarly adapted for the collection and conduction of the moisture which falls on it in the form of rain or dew. The leaf is thickest along its middle, but the thickness of the leaf, like its texture, varies according to the growth conditions which obtained during its development. A tough, woody texture is related to adverse environmental influences, while a high degree of succulence denotes particularly favourable growing conditions. The leaves of vigorous young slip plants come in the latter category, while those of starved or otherwise poorly developed plants tend to woodiness.

Width of Leaves.—The width of pineapple leaves varies, not only with their age, but also with the conditions under which they have been grown. The widest part of a leaf is usually about one-third of the distance up from its base. Other things being equal, width of leaf is a measure of rate and vigour of growth. The leaves of young plants propagated from slips are noticeably wider than those produced by plants which have been propagated from suckers, because their rate of growth is faster, due to the more abundant and more efficient root systems of the plants. Planting at too great a depth, particularly in the case of suckers, results in the development of narrow, stiff, spiky leaves. This condition is symptomatic of a poorly-developed and poorly-functioning root system, and is especially prone to occur on shallow, compact soils. Narrow, spiky leaves also tend to develop under conditions of shade and drought.

Anatomy of the Leaf.—Anatomically, pineapple leaves show pronounced adaptation to dry or semi-arid conditions. In cross-section, it is seen that the leaf is crescent-shaped and that its upper surface is protected by a waxy and highly-impervous membrane. Underneath this is a layer of colourless water-storage tissue which does not quite extend to the margins, while below this again is the tissue which contains the green chlorophyll and in which synthesis of starchy substances takes place. This latter part of the leaf is traversed longitudinally by bundles of fibres which serve both for the conduction of fluids and as supports for the softer tissues which surround them. The pineapple leaf contains a considerable proportion of tough, silky fibre and, in the Philippines, fibre obtained from the leaves of a wild variety is used for weaving a fine, linen-like fabric known as "Pina cloth." Like the upper surface, the under surface of the leaf is also protected by an impervious waxy membrane. Unlike the smooth upper surface, however, the under side of the leaf is grooved longitudinally in a series of tiny parallel furrows at the bottom of which are located the stomata, or breathing pores. During dry periods, water is removed from the storage tissue in the upper part of the leaf, causing it to shrink, with the result that the furrows on the under surface contract, thus reducing the loss of water from the leaf by closing the stomatal openings. As withdrawal of water from the storage tissue during dry periods reduces the thickness of the leaf, measurements of leaf thickness can be employed, where irrigation is practicable, to determine the times when a watering would prove beneficial. The furrows on the under side of the leaf are covered over their entire length with a dense mass of tiny, mushroom-shaped projections which are known as "trichomes." These trichomes give the "bloom" or mealy appearance to the under side of the leaf. They are considered to perform the dual function of protecting the leaf against undue water loss from the stomatal openings and of absorbing water from the surface of the leaf, particularly in the region of the white tissue near its base. For this reason, trichomes are sometimes referred to as "leaf hairs."

Spininess of Leaves.—The edges of the leaves may be smooth and unbroken, or serrated. The presence or absence of serrated or "spiny" leaf edges is an hereditary characteristic, and, consequently, varieties differ in this regard. The Smooth Cayenne variety is so named because of the normal absence of spines on its leaf edges, except for the few which may occur close to the tip of the leaf, and in Queensland the Queen variety, which has serrated leaves, is known as the Rough or Common Rough, to distinguish it both from the Smooth Cayenne and the Ripley Queen. A large proportion of the mutations or bud sports which occur

in smooth-leaved varieties possess spiny leaves and, in the Smooth Cayenne variety, spiny-leaved suckers are frequently encountered on normal smooth-leaved parent plants. There is some evidence to indicate that this tendency of smooth-leaved varieties to throw spiny-leaved bud sports is stimulated by adverse growing conditions, such as drought. Spininess of the leaves is an objectionable characteristic because it interferes with the easy handling of the crop. Since it is also an hereditary one, however, the tendency of the Smooth Cayenne variety to revert to this character may be checked by careful selection of planting material.

Orientation of the Leaves.—The leaves develop vertically from the growing point of the stem, but as they emerge from the heart of the plant they incline outwards. Plants or ratooning suckers should be spaced in a manner that will allow mature leaves to spread to an extent permitting of their adequate illumination. In low rainfall areas, where sunlight is intense, closer planting is not only permissible but often desirable than in localities where cloudy conditions prevail. Crowding of the plants, by reducing illumination of the leaves, results in slower synthesis of sugars and starches. Once leaves droop below the horizontal position, however, they retain little functional value. The leaves are arranged spirally on the stem in a manner that effectively shades the soil around the base of the plant. This shading both reduces evaporation

Plate 263.

Portion of the Hawaiian Pineapple Company's Plantation on the Island of Lanai, showing the semi-arid nature of the country as indicated by the character of the natural vegetation in the foreground. The mean annual rainfall over the greater part of this plantation, which is more than 12,000 acres in extent, ranges from 15 to 30 inches.

from the soil area from which the plant draws the bulk of its moisture requirements, and also assists in maintaining a relatively limited and even range of soil temperatures.

The manner in which the leaves are orientated also ensures that most of the moisture falling as rain or dew within a radius of about 2 feet of the stem is intercepted before it reaches the ground and that it is conducted to the soil at the base of the plant around which the roots are congregated. The ability of the pineapple to derive an appreciable proportion of its moisture requirements from dews is of special significance during periods of drought or where the crop is being cultivated under low-rainfall conditions. The establishment of extensive plantations under the arid conditions existing on the islands of Molokai and Lanai, in the Hawaiian group, has been made possible largely because of the heavy dews which are experienced in those regions (Plate 263).

Leaf Colour.—In apparently normal plants of the same variety leaf colour may vary from a brownish yellow-green through various shades of olive to a rich dark-green or a fresh pea-green. The pronounced yellow colouration of the leaves, known as chlorosis, which is symptomatic of malnutrition, arises from an extreme deficiency of either iron or nitrogen. In plants suffering from nitrogen deficiency, the chlorotic symptoms are most evident in the oldest leaves, the young heart leaves remaining moderately green, but the reverse is the case with iron deficiency. This is because iron contained in plant tissues is immobile, in contrast to nitrogen, which may be translocated or moved from mature or ageing tissues to actively-growing regions where the demand is greatest.

Colour variations in the leaves of plants which are not suffering from disease or any obvious nutritional disturbance are influenced by (*a*) varietal characteristics, (*b*) the stage of development of the plant, (*c*) temperature, (*d*) sunlight, and (*e*) the supply of iron and nitrogen.

Different varieties of crop plants frequently possess a distinctive shade of green in their foliage, and the pineapple is no exception in this regard; in fact, plants of the Queen and Ripley Queen varieties are commonly distinguished on this basis. The leaves of pineapple plants also present characteristic colour differences according to the stage of development which the plant has attained; in the early stages of growth the leaves of plants receiving adequate sunlight and nourishment are usually pea-green, but as they advance towards maturity the leaf colour intensifies until, at the time the flower buds appear, it is a dark olive-green, suffused with purple. This purple colour, like the reddish colour seen at other times and under other conditions, is due to a pigment (anthocyanin), which is formed from sugar contained within the leaf tissues. Since this pigment is produced to a much greater extent in some varieties than in others, it largely accounts for the characteristic differences in leaf colour which different varieties possess. In a given variety, however, the degree of leaf pigmentation varies considerably with changes in climatic and other environmental factors, since it develops only under conditions which favour the conversion of starch into sugars. Such conditions include a low rate of nitrogen absorption, and this accounts for the highly pigmented leaf colour—the so-called "winter colour"—which pineapple plants frequently assume in South-eastern Queensland during the months of July and August. The partial failure of the root system which occurs at this time is responsible for a

pronounced falling-off in the amount of nitrogen supplied to the leaves, even though an amount more than adequate for the needs of the plant may be present in the soil. In effect, this results in a condition of nitrogen starvation, and, in addition to mild chlorotic symptoms, the leaves develop pigment from the sugars contained in their tissues, even though the total amount of sugars present may not be high. The characteristic pigmentation of the leaves of wilt-affected plants results from similar causes in an aggravated form.

Shading exerts a pronounced effect on leaf colour, because light is essential for the synthesis, not only of the starch from which the red pigment is derived, but also of chlorophyll—the constituent of the leaf which gives it its basic green colour. For this reason, leaves which develop in the shade are almost invariably devoid of red pigment, and are frequently very lacking in green colour as well. Typical results of the effect of shading on leaf colour may be observed among the basal leaves of vigorously-growing plants in any densely populated field, and even more striking examples are provided by pineapple plants which are growing in the shade of papaw or other trees. Where illumination is intense or under conditions of nitrogen deficiency, a certain degree of shading may be beneficial in that it helps to balance the photosynthetic activity of the leaves with the intake of mineral nutrients. This partly explains how the practice of cultivating pineapples under shadehouses came to be established in Florida and other countries before the heavy nitrogen requirement of pineapples was fully recognised. Trimming or pruning of leaves during the winter months—once a common practice in Queensland—affects leaf colour in a manner similar to shading, since it reduces both the water and nitrogen requirements of the plant.

Provided there is no lack of available iron, a heavy supply of nitrogen is reflected in the leaf colour of a pineapple plant almost as markedly as a deficiency. The absorption of a quantity of this element in excess of the normal requirements of a plant results in the development of either a bright pea-green or a dark, almost black-green leaf colour—depending on the age of the plant—and a soft, flabby type of growth which is in marked contrast to the fibrous, woody tissue which is formed under conditions of nitrogen deficiency. The practical significance of the colour changes which take place in pineapple leaves at various stages of growth and under different environmental conditions, lies in the fact that they provide an indication of the growth status of the plant at any given period, and thus, if intelligently interpreted, may be used as a guide to both the fertilizer requirements of the crop and the most suitable times for applying it. Further attention is given to leaf colour in relation to fertilizing practice in the section dealing with the use of fertilizers.

The Fruit.

The pineapple fruit is not a true fruit in the botanical sense, but is a sorosis or collective fruit formed by the coalescence of a large number of individual fruits, or, as they are more commonly termed, "fruitlets." The fruit is borne in the centre of the plant on a stalk about an inch thick and 6 to 8 inches long. This stalk is a prolongation of the stem of the plant, and it passes right through the fruit to form a central core on which are attached the fruitlets which make up the fruit. The core is terminated by a growing point from which a rosette of leaves develops to form the "top" or "crown" which surmounts the fruit.

Development of the Inflorescence or Flower Head.—The flower bud from which the fruit develops normally appears at the apex of the stem in the heart of the plant from ten to fifteen months after planting. Its appearance is preceded by the development of a general reddish colouration in the young leaves surrounding the apex of the stem. Prior to this, however, a diffused red colouring is noticeable on the white tissue at the bases of these heart leaves and its appearance is the first visible indication that a flower-head is about to emerge. In the spring and autumn, development of the flower-head in the growing point of the stem begins about six weeks before pigmentation of the heart leaves becomes evident, and a similar period elapses before the first flowers appear. Blossoming commences at the base of the flower-head and proceeds upwards in spiral fashion. It takes from three to six weeks for all of the florets on a flower spike to open, the rate of blossoming being retarded by cold conditions. The flowers are usually violet in colour, though there is some variation even in the same variety; they are relatively inconspicuous, since each is borne in the axil of a bright-red protective bract. After flowering has finished, these bracts change to a green colour and develop to form the "scales" which partially cover the fruitlets or "eyes" at maturity.

Period Taken by the Fruit to Reach Maturity.—In summer, the fruit reaches maturity in about four and one-half months after blossoming is completed, though varieties differ somewhat in this regard. During the colder months of the year, however, the development of the fruit takes much longer; flower-heads which blossom in May are not usually ready for harvesting before late December. In South-eastern Queensland, fruits of the Smooth Cayenne variety, which develop during this period, are characterised by abnormally protuberant and sharp pointed "eyes." For this reason, they have come to be known as "prickly eyed" or "Christmas" pineapples, to distinguish them from the normal flat-eyed type of Smooth Cayenne fruit.

Ripening of the Fruit.—As the fruit approaches maturity, the colour of the skin generally begins to change from green to yellow. Change of skin colour does not constitute an infallible index of ripeness, however, because the development of red and yellow pigments in the skin of the fruit is influenced by the same factors as development of pigment in the leaves. Under certain conditions, it is possible for the skins of immature fruits to be fully coloured and for that of fully ripe fruit to remain quite green. An extreme example of premature development of skin pigment is afforded by the colouring-up of partially grown fruits which occurs on wilt-affected plants.

Because the degree and extent of skin colouration which accompanies ripening is determined by the conditions under which the fruit develops, attempts to define the minimum stage of maturity acceptable to either canneries or fresh-fruit markets by so-called "colour standards" can never be wholly successful. With a little practice, snapping a finger against the side of a partially coloured or green-skinned pineapple is a reliable method of determining whether it is ripe, since a ripe fruit emits a dull pinking sound, and an immature one a hollow ring. In the case of fruit that are more than three-quarters coloured, tapping is unnecessary, as they are obviously ready for harvesting.

Ripening in the pineapple fruit begins at the core and proceeds outwards to the skin. The basal tissues ripen some time in advance of

those towards the top, but it is always advisable to pick the fruit before this stage is reached in order to avoid the development of an over-ripe condition in the lower portion. Ripening is associated with a marked accumulation of both sugars and acids in the fruit tissues. While sugars continue to accumulate right through the ripening process, however, the acids begin to decompose in the later stages. In yellow-fleshed varieties, the development of yellow pigment, principally carotin, takes place chiefly in the final stages of ripening. Accumulation of sugar in the tissues ceases when the fruit is picked, though the acid content may continue to increase if it is not fully mature. The sugar and acid content of a ripe pineapple fruit—the two constituents which chiefly determine its eating quality—is greatly influenced by the conditions under which it is grown. Factors influencing fruit quality are discussed in a subsequent chapter.

Fruit Size and Weight.—Within certain limits, fruit size is an inheritable characteristic, and varieties may be loosely defined as either small or large-fruiting types. The Queen is an example of the former, while the Smooth Cayenne is the best known of the large-fruiting varieties. Size is not strictly synonymous with weight, since the extent to which small cavities or pore-spaces occur in the flesh of the fruit varies considerably, but the two are generally closely correlated. Although weights up to 14 lb. have been recorded for individual Smooth Cayenne pineapples, well-grown fruits of this variety average between 5 and 7 lb. Fruits of the Queen variety, however, normally do not exceed about half this weight.

Apart from hereditary influences, the size of a pineapple fruit is determined by (*a*) the number of fruitlets which go to make up its structure and (*b*) the extent to which these fruitlets develop during the period of fruit growth and ripening. The number of fruitlets is fixed at the time the flower bud forms in the growing point of the parent stem, and, consequently, it is influenced by the vigour of growth at this time. On the other hand, the size to which these fruitlets develop and the degree of porosity which their tissues present are determined by the growth status of the plant after flowering has taken place. Marketable fruits of the Smooth Cayenne variety may consist of anywhere from 100 to 200 fruitlets or "eyes." In South-eastern Queensland, fruits of this variety which mature during March and April, generally contain fewer fruitlets and are of a smaller average size than those picked during the late winter and spring months, though the flesh of the summer-maturing fruit is usually closer-textured and possesses fewer pore spaces. This is because flowering for the summer crop occurs in the dry spring months and is preceded by an unfavourable growth period, while the development and ripening of the fruit takes places under highly favourable growing conditions; conversely, the flowers which develop into winter-maturing fruit are formed at a time when the plants are making vigorous growth, while ripening of the fruit occurs at a time when the growth rate is at its minimum.

Fruit Shape.—In general, fruit shape is a varietal characteristic, and as such is hereditary. Cultivated varieties or strains of varieties have conical, cylindrical, or barrel-shaped fruits. For both canning and fresh consumption, cylindrical or barrel-shaped fruits are preferred to conical ones: in the former case, because they yield a higher recovery of slices; and in the latter, because they are easier to pack. In the late winter and spring months, however, a pronounced tendency towards a

conical shape is generally evident in the fruits of all varieties. Hybrids resulting from the cross-pollination of cultivated varieties may produce grossly freak-shaped fruit, and, to a lesser degree, the same tendency is often exhibited by bud sports (mutations). The "bottle-neck" type of Smooth Cayenne is an example of this tendency. Plants throwing objectionably shaped fruit should be pulled out on sight to obviate any risk of their being used as sources of planting material.

Seediness in Pineapple Fruits.—Pineapple fruits are usually seedless because the flowers of the cultivated varieties are normally self-sterile. Pollination by insects rarely occurs, owing to the effective protection afforded the reproductive organs by the floral envelope. Occasional seedy fruits do occur, however, particularly in the Smooth Cayenne variety, but these almost invariably result from self-pollination in bud sports. Consequently, the production of seeds in pineapple fruits may be regarded as an inheritable characteristic, but since seediness is much more prevalent in some seasons than in others there is evidence to indicate that its occurrence is to some extent influenced by the climatic conditions obtaining during the blossoming period. Obviously, the elimination of seedy stock is difficult owing to the fact that the character cannot be determined without destroying the fruit.

Suckers and Slips.

These offshoots from the main axis of the plant have fundamentally different origins. Suckers arise from the stem of the plant and are vegetative outgrowths, while slips, which sprout from the fruit stalk, are essentially rudimentary reproductive organs. The buds from which the slips develop begin to grow before blossoming of the flower-head is completed. Production of suckers is favoured by conditions which favour vegetative growth, while the reverse tends to be true for slips. Under Queensland conditions, a much heavier production of slips is associated with summer-maturing than with winter-maturing fruit, because, as previously pointed out, conditions are not usually favourable for vigorous vegetative growth at the time the summer-crop flowers appear.

Suckers are borne in the axils of leaves on the stem proper: slips in the axils of bracts on the fruit stalk. Slips also differ from suckers in that primitive or abortive fruits develop at their bases. These appear to be subordinate flower-heads in which processes leading to the development of a fruit are inhibited at an early stage, after which growth of the terminal shoot becomes dominant. In the Smooth Cayenne variety, a type of shoot intermediate between suckers and slips sometimes develops in the vicinity of the junction of the fruit stalk and plant stem. These shoots possess the characteristic loose, open structure of a slip, but lack the abortive fruit or knob which distinguishes the latter type of shoot. In Hawaii, these intermediary shoots are known as "hapas," from the Hawaiian word meaning "half." Several different names are applied to slips in Queensland, some of which find usage only in certain localities. Names in common use are "gill sprouts," "buttons," "nibs," and "robbers."

The number of suckers or slips which may develop from an individual plant is determined not only by the environmental conditions affecting the vigour of the parent, but also by inheritance factors. Certain varieties consistently throw more suckers than others, e.g., the Queen, or Common Rough, which is very prolific in this regard. Plants of the Smooth Cayenne variety rarely produce more than four suckers, and usually not more than three, but their capacity for slip production

varies considerably. In this variety, a free suckering habit is usually correlated with a weak slipping tendency, and *vice versa*. A tendency to excessive slip production is a very objectionable characteristic, since development of slips on the parent plant takes place at the expense of the fruit. However, varietal strains can be selected and maintained in which the tendency to slip production exists only within defined limits. This fact has important practical applications, since slips are preferred for propagating purposes. Slip production occurs chiefly in the first or "plant" crop.

Ratooning.

Only one fruit is produced at the apex of any individual stem. After the fruit has been harvested, the portion of the fruit stalk remaining in the plant dries out and dies, and the leaves, which have fulfilled their function, begin to droop and wither. Long before the fruit is mature, however, suckers begin to develop from buds in the leaf axils towards the base of the plant. The points along the stem at which these suckers arise may be located either above or below ground level. The latter are referred to as "ground suckers" to distinguish them from those arising on the aerial portion of the stem. They shoot only from vigorously growing plants, and never very abundantly. The suckers are first nourished by the parent stem from the reserves of starchy materials stored in its tissues. Those which are not removed, and which receive adequate light and nourishment go through the normal vegetative and reproductive growth cycle and, about a year subsequent to the harvesting of the plant crop, another crop of fruit matures on them, which is known as the first-ratoon crop. As the first-ratoon fruit is developing on the primary suckers, these latter produce secondary suckers, which, in turn, produce the second-ratoon crop. In practice, the crop which is harvested in the year following the first-ratoon crop, is termed the "second-ratoon" crop, but an appreciable proportion of this crop is generally produced by late-flowering primary suckers. The delayed flowering in these "holdover" suckers, as they are called, results from shading or other repressive influences brought about by overcrowding. Ground suckers are apt to suffer particularly in this regard, and usually do not fruit until the second year. Moreover, the fruit produced by ground suckers, like that of second ratoons, is generally small and of poor quality.

To some extent, the delayed fruiting of ratoon crops can be obviated and the fruit size and quality improved by systematic thinning of the suckers. Unless this is done, or the rows have been widely spaced, a plantation rarely remains profitable after the second-ratoon crop has been harvested, because of the progressive reduction in the size of the fruit, and a consequent diminution in the yield. In the early days of pineapple-growing in Queensland, regular thinning of ratoon fields was assiduously carried out and, because of this and of the wide spacing of the rows which was then customary, it was possible, by careful cultural methods, to maintain such fields in profitable production over very long periods (Plate 258). When the production of fruit for fresh consumption is a prime consideration an advantage possessed by old ratoon fields over young plantations is that peak crop periods tend to disappear, since flowering is spread over most of the year. Consequently, the high prices secured during periods of scarcity compensate to some extent for the low average yields obtained.

(TO BE CONTINUED.)

Influence of Seasonal Conditions on the Development of Cercospora Leaf Spot of the Banana, with Special Reference to the Control Programme.

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THE fungus *Cercospora musæ*, which is responsible for the leaf spot of bananas here considered, has been known in the East Indies since the early part of this century, but was not regarded as a serious banana parasite until it became associated with a destructive epidemic in the Sigatoka district of Fiji in 1913. Ten years later it appeared in epidemic form in Queensland. More recently—in 1933—the organism appeared in Trinidad, and has since spread rapidly through the banana-growing areas of the West Indies and adjacent countries, where the disease probably now ranks next in importance to Panama disease.

In Queensland at the present time, leaf spot does not appear to be present in the extremely virulent form characteristic of the first few years of its introduction. A similar reduction in intensity seems to have taken place in Fiji. The rapid destruction of leaves characteristic of infection of an epidemic nature scarcely provides time for effective spore production, and would particularly affect the fungal population available for over-wintering purposes; hence it is possible that the more virulent strains have gradually become eliminated in favour of those of moderate effect.

Some doubt exists as to how much loss can be directly attributed to Cercospora leaf spot and how much to the association of this disease with unfavourable growing conditions and other diseases. Environmental conditions contributing to leaf spot damage in Queensland have been discussed by Simmonds (1933), and in New South Wales by Magee (1936). In Fiji, Parham (1934) has discussed various factors connected with soil, location, and cultivation in relation to the occurrence of banana diseases, particularly leaf spot. Poor drainage or a mechanical condition of the soil affecting the normal water relationships of the plant, is considered specially detrimental. In the West Indian region a number of workers, including Stell (1936, 1938), Smith (1937), and Larter (1938), Ward (1938), and Roger (1938), have commented on the association of severe leaf-spot damage with unfavourable growing conditions. Ward makes the statement that in Jamaica "severe damage has only taken place on lands which cannot be considered first-class banana lands for the sustained cultivation of the banana crop." This summarises in a general sense the opinion of the majority of authors cited here.

Development of the use of Fungicidal Control Measures.

While it is generally admitted that the choice of a suitable site for banana-growing will considerably reduce the damage resulting from the presence of leaf spot, it is not always economically possible to obtain such sites. Moreover, in years when climatic conditions favour the development of the disease, appreciable loss may occur even in good areas. Hence attention has been directed to the control of the disease by means of fungicides. In Queensland, applications of a copper carbonate dust did not prove successful (Simmonds, 1933). In a later experiment,

using Bordeaux mixture as a wet spray, in February and March, good control was obtained of speckle, but with regard to leaf spot the spray was only slightly effective. In Fiji, Surridge (1933) and Parham (1934) report the use of a number of different fungicides, but with indifferent results. A few years ago Magee (1936) stated that dusting experiments carried out in New South Wales showed no promise of success. In Queensland the position was taken that on the steep hillsides and with the poor water supply typical of plantations in this State, spraying operations in a normal season would scarcely be likely to justify the expense and labour involved. A more practical solution appeared to be the practice of bagging the bunches so that the fruit would fill out and mature normally in spite of leaf defoliation. The various advantages of this practice have been stressed by Mitchell and Miles (1936). The poor results which attended these earlier efforts at fungicidal control can be attributed in part to the empirical nature of the work, which was not based on a thorough knowledge of the complex relationships existing between the fungus, host plant, and meteorological conditions. The lack of efficient spreading agents to assist in effectively covering the waxy banana leaf was also a drawback.

With the spread of *Cercospora* to the West Indies and the losses suffered there, renewed attention has been focussed on the disease. The excellent work of Stahel (1937) on the biological relationships of *C. musæ* with the banana plant greatly contributed to the practical solution of control measures dependent on the application of fungicides. More efficient spreaders have also enabled a more effective covering of the leaf. As a result, the control of Cercospora leaf spot by the application of copper fungicides is now being practised in parts of the West Indian region, where economic considerations permit, with some success (Stahel, 1937; Ward, 1938). Renewed interest has also been taken in this question in New South Wales, and Magee and Foster (1938) have recorded good results from the application of 1-1-10 Bordeaux mixture plus Agral made according to several different schedules of an exploratory nature. It is possible that, with the additional knowledge now available, a modified spraying programme might be both practical and beneficial in certain favourably situated Queensland plantations.

While the possibility of obtaining a fungicidal control for leaf spot was still under consideration in Queensland, data were collected regarding the influence played by seasonal and weather conditions on the development of the disease. The object in view at the time was to determine the period at which sprays could be most effectively applied. With the reawakening of interest in this question, it is thought that the data, incomplete as they are, may be of considerable interest to those at present working on the subject and may lead to a quicker realisation of the most efficient and economical spraying schedules. Observations have been made in connection with natural field infection with *C. musæ* and with a small number of artificial inoculation experiments. Most of the work was carried out during the years 1933 and 1934.

The Life History of *Cercospora musæ* on the Banana.

As it is important to understand the biological relationships between *C. musæ* and the banana plant, a brief review will be made of Stahel's (1937) work on this subject, commenting on any features which do not appear to apply under Queensland conditions. According to this author, conidia germinate in a film of water, and the germ tube commences an

epiphyllic existence which may last from four to eight days, depending on the extent moisture is present on the leaf. The germ tube then penetrates through a stoma and commences a parasitic existence of about twenty days in the air chamber between two veins. The initial streak stage, consisting of a faint greenish-brown line 5 to 10 mm. long, is eventually produced as a result. After this stage is reached, brown hyphæ grown out through the stomata of the mature streak and extend in an epiphyllic manner for 2 to 3 mm. around the streak. Infiltration of the underlying tissue takes place by a guttation process, and the fungus penetrates the infiltrated tissue from the outside through the stomata. This results in the production of a narrowly elliptical brown spot—the brown stage. One or two days after the second epiphyllic stage commences, acervuli may start to form below the stomata of the brown area. After one or more weeks, during which spore production may take place, the brown spot dries out in the centre and becomes grey.

From observations which will be described in more detail later it appears that the different developmental periods are not necessarily always of the same duration as given by Stahel. Moreover, it is doubtful whether the second epiphyllic stage of the fungus and the infiltration are of as general occurrence as one would infer from his writing.

By artificially inoculating banana leaves on both surfaces, Stahel showed that the lower surface was very much more susceptible than the upper. He also deduced from sixty-two inoculations on the lower surface that the two youngest leaves are by far the most susceptible, the third is much less so, while the fourth and fifth are scarcely susceptible at all. This is not fully in accord with the inoculation experiments described below.

As a result of the incubation period, lesions may not become noticeable until the infected leaf is the second to the fourth from the top, depending on the rate of growth of the plant. In Queensland the first appearance of new streaks is most commonly seen on the fourth youngest leaf, though it is quite frequently seen on the third and the fifth. It must be remembered that Stahel's experiments were carried out with the Congo variety of banana, and those in Queensland with the Cavendish.

Artificial Inoculation Experiments.

Four artificial inoculation experiments have been carried out in Queensland, and these are of interest in connection with the field observations to be recorded later. These experiments were all carried out in the departmental plot in Brisbane where no leaf spot or other disease was present to confuse the result. As *C. musæ* does not form spores in artificial culture, spores were, perforce, obtained from suitable fruiting material collected in the field. For inoculation a suspension of the spores in water was applied by means of an atomiser. By regulating the number of squirts, approximately equal amounts of inoculum were applied to each leaf or half-leaf in each experiment. Except in the case of Experiment IV., the plants were moderately young. The leaves are numbered from the youngest down. The nature of the experiments was as follows:—

Experiment I.—Two plants inoculated on 11th January, 1933. Spore suspension applied to the upper ten leaves of each—on the right-hand side of the leaf to the upper surface, and on the left-hand side to the lower. Spore germination in banana-leaf infusion was 80 per cent.

Experiment II.—One plant inoculated 26th January, 1933. Spore suspension applied to the top ten leaves over the whole of either the upper or lower surface as follows: Leaves 2, 4, 6, 8, 9 on the upper side, and leaves 1, 3, 5, 7, 10 on the lower side. Spore germination in leaf infusion was 66 per cent.

Experiment III.—One plant inoculated 20th February, 1933. Suspension applied to both surfaces of six inoculated leaves. Four leaves enclosed in glacene sleeves for varying periods and sprayed at intervals with water to ensure the presence of moisture or, at least high humidity. The period of enclosure was as follows: Leaves 4 and 9 no glacene; leaves 5, 6, 7, and 8 enclosed for 64, 24, 16, and 40 hours respectively. Spore germination in leaf infusion was 85 per cent.

Experiment IV.—One plant about three-quarters grown inoculated 9th March, 1939. Suspension applied to leaves 2, 3, 4 and 5 on the right-hand side of each to the upper surface and the left-hand side to the lower surface. Leaf 1 was not unfurled, and a varying amount of inoculum was applied to the inner and outer surfaces of the funnel.

After inoculation, the plants were kept under observation and the first appearance of lesions of the streak stage noted. The streaks were marked with Indian ink when first observed so that any fresh developments could be distinguished. (In Experiment IV. the total number of streaks were recorded at each examination.) The time at which streaks subsequently passed to the brown stage was also recorded. The results from these four experiments are summarised in Tables I. and II.

TABLE I.

THE NUMBER OF LESIONS DEVELOPING ON BANANA LEAVES SPRAYED ON THE UPPER OR LOWER SURFACE WITH A WATER SUSPENSION OF CERCOSPORA MUSÆ.

Experiment.	Surface.	Positional Number of Leaf from Youngest Down.										Totals.
		1	2	3	4	5	6	7	8	9	10	
I. ..	Upper	0	*158	21	0	0	0	*39	0	0	0	218
	Lower	2	*143	21	19	1	0	*51	0	0	0	237
II. ..	Upper	..	7	..	31	..	0	..	0	0	..	38
	Lower	274	..	280	..	36	..	0	..	..	0	590
III. ..	Both	..	..	..	5	*46	*72	*8	*13	4	..	..
IV. ..	Upper	0	16	92	276	491	..	..	..	..	..	875
	Lower	65	630	1,123	703	462	..	..	..	..	..	2,983

* Leaf enclosed in glacene sleeve for certain period (*see* text).

In a general sense, Stahel's contention that it is the youngest leaves which are most susceptible to infection holds for the Cavendish banana in Queensland, but it is evident that, provided conditions are suitable—and moisture may be the most important factor in this respect—quite extensive infection may take place in leaves older than the third youngest—for example, the fourth and fifth.

The lower surface of the leaf is definitely more open to infection than the upper. The proportion in favour of the lower surface—including the figures for Experiment I., which may be abnormal—is over three to one.

The development on those leaves enclosed in a glacene sleeve emphasises the important part played by the presence of moisture in

infection. The limited interpretation which may be placed on Experiment III. suggests that the minimum period for which moisture must be present to ensure satisfactory infection lies between sixteen and twenty-four hours.

Influence of Environmental Conditions on Infection Judged from the Artificial Inoculation Experiments.

An attempt was made to correlate the time of infection and length of the developmental periods shown in the inoculation experiments with the prevailing weather conditions and thus have information available to apply in the field. Exact meteorological data were available for this purpose from the Brisbane Meteorological Office.

The development of the streak stage in the four experiments just described and data regarding temperature, humidity, and rainfall are contained in the accompanying graph on page 638. It is unfortunate that, owing to the writer's absence, the first two observations on Experiment IV. were rather widely separated. It should be noted that in Experiment IV. each unit represents eight times the number of streaks as in I., II., and III.

The temperature recorded is the average of the daily minimum and maximum. Rainfall is given for the twenty-four hours, midnight to midnight, with anything less than ten points omitted. A distinction has been made between effectual (continuous line) and non-effectual (broken line), the difference being that in the case of the former the rain has fallen more or less continuously throughout the day. "Day" is used here in the sense as distinct from the night. The reason for this differentiation will be discussed later. High relative humidity has been indicated by a cross, which signifies that on the day marked the humidity was 80 per cent. or over at each of the 9 a.m., 3 p.m., and 9 p.m. readings. It should be noted that after 7th March the temperature, rainfall, and humidity data refer to 1939—the year in which Experiment IV. was carried out.

Below the base line horizontal lines indicate the incubation period from the probable data of germination to the appearance of the first visible streaks. In the case of leaves enclosed in glacene, the dates of inoculation and germination probably coincide. In other cases, germination is assumed to have taken place on the first day that suitable conditions, judging from weather records, occurred. Confirmation of the dates selected is available in some instances. For example, a consideration of the detailed daily weather information shows that germination in the case of Experiment II. evidently took place on 27th January. The first streaks appeared on 24th February. The first streaks from Experiment I., no glacene, appeared at the same time as these, and it can be inferred that germination in the case of the latter experiment was delayed until 27th January also. Although actual proof that the dates selected are the correct ones is not forthcoming, there is strong circumstantial evidence that in most cases they are so.

The nature of the rainfall is important from the point of view of providing conditions suited to germination and infection, especially in view of the early epiphyllic existence of the fungus. Simmonds (1933) states that spores of *Cercospora musæ* take from twelve to eighteen hours, or even longer, to germinate. Stahel (1937) records that a film of moisture is required for the growth of the germ tube, and the results

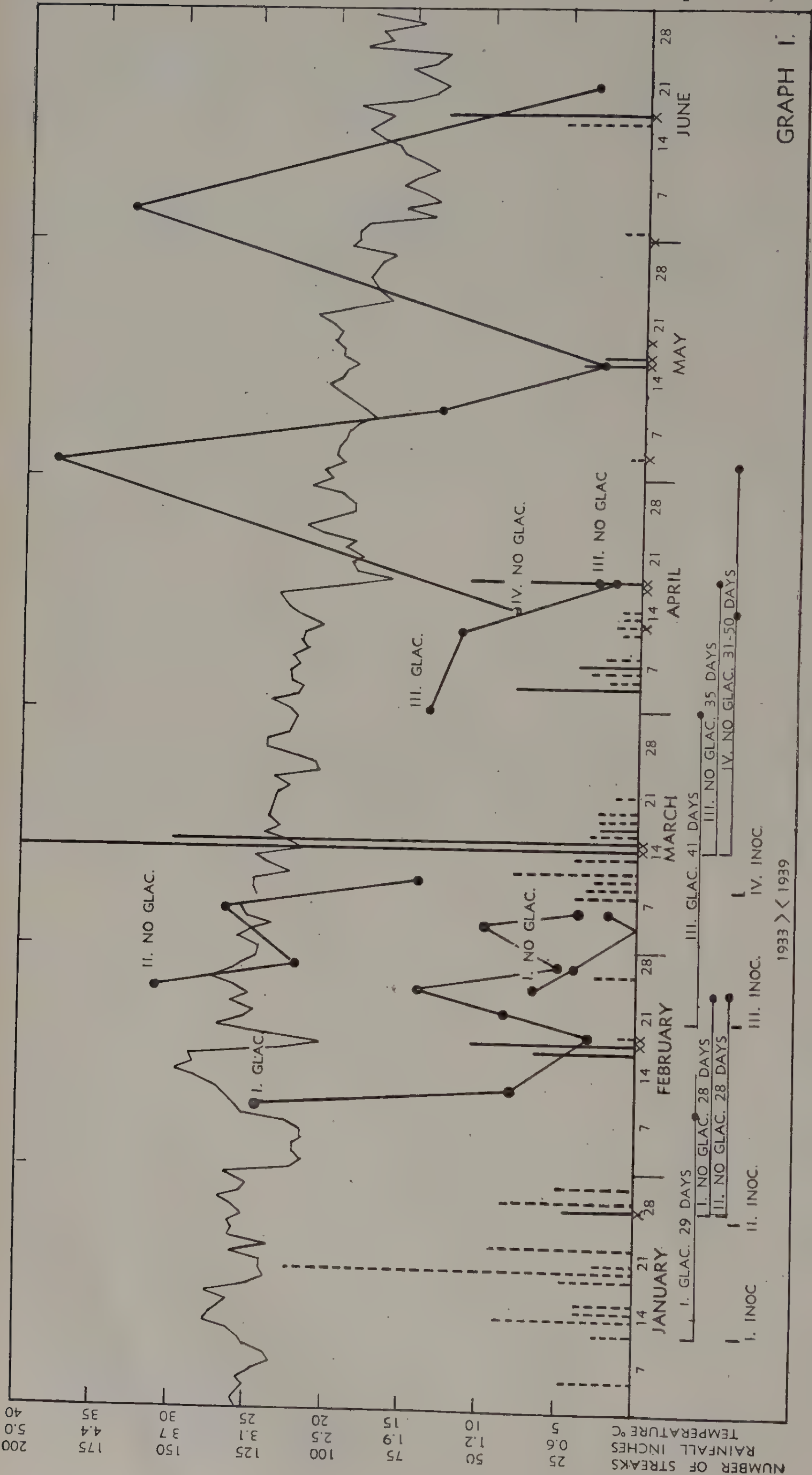
GRAPH I.
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
I. GLAC.
II. NO GLAC.
I. NO GLAC.
III. GLAC.
IV. NO GLAC.
III. NO GLAC
I. GLAC. 29 DAYS
I. NO GLAC. 28 DAYS
II. NO GLAC. 28 DAYS
III. GLAC. 41 DAYS
III. NO GLAC. 35 DAYS
IV. NO GLAC. 31-50 DAYS
I. INOC
II. INOC.
III. INOC.
IV. INOC.
1933 >< 1939
NUMBER OF STREAKS
RAINFALL INCHES
TEMPERATURE °C

Plate 264.

of Experiment III. just described suggest that at least sixteen to twenty-four hours' continuous moisture may be necessary for satisfactory completion of the infection process. These points suggest that heavy dews or night rains would be insufficient to initiate infection. In the different artificial inoculation experiments, a comparison between the time of appearance of streaks when moisture was supplied artificially and when germination was dependent on natural precipitation, considered in conjunction with the rainfall record, indicates that more or less continuous moisture for at least a day and night period is required to initiate infection, and for specially high infection longer periods are necessary. Rainfall of short duration, even though heavy, does not appear to have been efficient for this purpose. This hypothesis is supported by the results of field observations which will be described later. Hence rain is not considered to be effectual unless it falls throughout the greater part of the day time. Heavy dew or intermittent showers may supply sufficient moisture during the night. In the same way, high humidity, to exert a determining influence, must continue through the warm as well as the cooler parts of the day.

The effect of temperature is fairly well defined. The length of the incubation period required before streaks develop increases with decrease in temperature. The period over which new streaks may appear as a result of the one inoculation also lengthens at the same time. The times taken for the streak and brown stages to develop after germination are given in Table II.

TABLE II.

Days Involved in the Developmental Periods when Banana Leaves are Artificially Infected with Cercospora musæ.

Experiment and Date of Inoculation.		Glacene or no Glacene.	Germination to Streak Stage.		Initial Streak to Brown Stage.		Shortest Period from Initial Streak to Fruiting.
			Minimum	Maximum.	Minimum	Maximum.	
I.	11–1–33	In glacene	29	54	3	23	16
		No glacene	28	38	3	*14	5
II.	26–1–33	No glacene	28	42	2	29	9
III.	20–2–33	In glacene	41	57	8	23	11
		No glacene	35	35			
IV.	9–3–39	No glacene	31	71	19	*103	33
Extremes for the series ..			28	71	2	103	5 — 33

* Approximate.

The minimum period from germination to the development of the streak stage appears to be about a month, but this may extend to over two months. The streaks either pass rapidly in the course of a few days to the brown stage or this transition may be delayed for as long as three months should cool weather intervene. In Experiment IV. leaves which were the first and second youngest at the time of inoculation exhibited a few streaks, passing to the brown stage nearly six months later, when these leaves were commencing to show signs of failure due

to old age. Providing moisture conditions are suitable, spore formation is probably possible as soon as the brown stage is reached, but is usually delayed, awaiting rain or heavy dews to stimulate development.

The appearance of streaks in peaks of development subsequent to the first appearance is of interest and difficult to explain satisfactorily. In a few instances this might be due to germination in a second period of more favourable weather, but the length of the incubation periods do not permit of this explanation in many cases. A more probable explanation is that the fungus is present within the tissues in an inactive or latent condition, and requires a lowering of resistance on the part of the host such as might occur with the ageing of the leaf or as a result of a sudden drop in temperature.

Although not shown on the graph, it is a matter of frequent observation in Queensland that quite a number of the initial streaks never reach the brown stage or that their transition to this stage is considerably delayed. This phenomenon also appears to be linked with host resistance, since streaks which have been dormant for long periods have been observed to pass to the brown stage as the leaf ages or is weakened by the invasion of other fungi. It is possible that growing conditions exert their influence on leaf-spot development by accelerating or retarding the transition of the streak to the brown stage, on the appearance of which actual damage depends. For example, Croucher (1938) records a case arising out of fertilizer trials in Jamaica where excess phosphate, in the absence of adequate potash, was conducive to premature leaf-ripening, which, in turn, affected the severity of leaf-spot attack.

Field Observations.

The artificial inoculation experiments just recorded were supplementary to field observations directed to obtain more comprehensive information on the effect of seasonal conditions on leaf-spot development. This work was carried out over the period from September, 1932, to December, 1934. Detailed observations were restricted to the plantation of Mr. F. J. Calvert, Mount Mellum, via Landsborough, but were supplemented by notes taken from time to time elsewhere.

At Mount Mellum several plants, varying in number during the course of the work from five to ten, were selected for observation purposes. These plants differed in age, but were at least half-grown rather than younger, and several bunched during the course of the experiment. The plantation was visited as opportunity permitted, the visits being more frequent during the summer months, when leaf spot is more active in its development. At the time of visiting, the leaves on each plant were numbered in series for record purposes, and observations were made for streak development. The number of new streaks was recorded for each leaf. When not too numerous, all fresh streaks were marked with Indian ink so that any subsequent developments could be distinguished. Note was also taken of the time at which the streaks passed into the brown stage. The time when individual leaves died and the reason for their death were also recorded.

Meteorological data were obtained as a result of assistance rendered by Mr. Calvert. In addition to recording actual precipitation, Mr. Calvert supplied details of the nature and approximate duration of the rainfall and relevant comments on the weather in general. Humidity and temperature were recorded on seven-day charts by a thermo-hygrograph situated near the plantation.

The relevant data have been expressed graphically in Graph II. When recording the number of streaks present, it was necessary at times to make an estimate if the spots were too numerous to count satisfactorily. To obtain a numerical basis for graphical representation, streaks, when numerous, were counted as 50, and very numerous, as 100. This, on the average, is considerably on the low side, so that the peaks were actually relatively higher than recorded. The average number of new lesions per plant examined divided by five gave the unit employed in the graph.

Below the base line horizontal lines connect each main peak outbreak with the probable date or dates on which infection occurred, as in the previous graph. In addition, a dotted line extends to the date on which 50 per cent. or more of the original streaks had passed to the brown stage. This represents the approximate date on which the result of the particular infection would become obvious in the plantation.

The method of expressing the meteorological data is essentially the same as for the first graph. Continuous and interrupted lines distinguish between effectual and non-effectual rainfall. The former represents a day which was overcast throughout, with rain falling continuously throughout the greater part. The latter represents a fall of short duration during the day or night, or continous rain falling only at night. Humidity is recorded by indicating with a cross those days on which the relative humidity was 80 per cent. or over throughout the whole twenty-four-hour period. Horizontal dotted lines mark off the temperature range within which the fungus *Cercospora musæ* is capable of 75 per cent. of its maximum growth.

Influence of Rainfall and Humidity.

Rainfall is important from the point of view of providing suitable conditions for the initial germination and development of the germ tube, and later for the production of spores on the mature spots and their dissemination. In linking an outbreak of streaks with a particular period of rainfall, the hypothesis discussed in connection with the artificial inoculation experiments has been made use of—namely, that, for infection to take place, more or less continuous rain for the whole of one day and moist conditions during the night are required. Working on the hypothesis of effectual and ineffectual rainfall, it has been possible to link each outbreak with a previous period of suitable wet weather. In making this correlation, advantage has been taken of the knowledge that the leaves are most susceptible in their younger stages, and, when tracing back the infection date, the day that a suitable fall of rain occurred when the particular leaf was in its susceptible stage was taken to be the date required. The information gained in the inoculation experiments regarding the dormancy periods at different times of the year has also been considered, and it has not been necessary to postulate infection, unless of a very minor nature, at any period other than during rainfall conditions of the nature described.

While one day's continuous rain is considered essential for satisfactory germination, it is probably necessary to have this supported by one or more days' additional rain or by several days on which the humidity is exceptionally high throughout the twenty-four hours. It will be noted that for the majority of points at which infection is judged to

have occurred such conditions have prevailed. The few days of epiphyllic existence which Stahel has described would certainly suggest the need for these conditions.

It will be noted that high humidity readings are, for the most part, associated with rainfall, and particularly with those periods in which infection has probably occurred. This high relative humidity supplements the effects of the rain by preventing evaporation of the surface film on the leaf, and ensures against desiccation of the germ tube during short intervals of clear weather.

Although not brought out in the graph, another very important function of rain is connected with the production and dissemination of spores. Stahel (1937) has recorded that conidia are produced only when the lesions are covered with a film of water such as produced by heavy dew or drizzling rain. A similar state of affairs evidently exists in Queensland, since the production of heavy crops of conidia after a day or two of wet weather has been a matter of common observation. Spore dissemination, no doubt, takes place readily by means of air currents, but it must be remembered also that the broad, flat leaves of the banana are specially adapted to distribution and reception of spores by means of raindrops, particularly by splashing from the old lesions below to the under highly susceptible surface of the young leaves above.

It will be noted that the year 1933 had a comparatively dry summer compared with the wet year 1934. However, although the falls were light in the former case, there were sufficient rainy periods to give rise to approximately the same number of peak outbreaks in 1933 as 1934. Although not brought out in the graph, infections in 1934 were more intense. This is reflected in the records of the actual cause of leaf failure in the observation plants over the two years. Throughout 1933, 1·5 leaves per plant died from leaf-spot attack as the major cause, while 12·7 died as a result of speckle and for natural reasons. In 1934, 6·8 leaves per plant were judged to have died from leaf-spot infection as the major factor, and 8·2 from other causes. In both years many leaves, at the time of their failure, were affected by more than one disease. Where the proportions were such that a decision regarding the major cause of death was difficult, half a leaf was allocated to each cause in computing the above figures.

A winter rainfall associated with abnormally high temperatures such as occurred in July, 1933, is scarcely likely to be repeated very frequently. In this instance it had the effect of providing an abnormally high streak and brown-spot development in the early summer months following. This would be expected to accelerate the ensuing summer outbreaks.

Influence of Temperature.

The most striking feature shown by the graph is the effect of temperature on the development of the disease. The temperature relationships of *C. musæ* have been worked out by Simmonds (1933). The optimum for vegetative growth is about 25 degrees to 26 degrees C., and that for spore germination and germ-tube development is somewhat higher. A fair spore germination is possible at lower temperatures, but the time required may be extended to as long as forty-eight hours. For practical purposes, the temperature range within which it is possible to obtain a growth equal to 75 per cent. or more of the maximum is considered of more use than the optimum itself, since the latter by no

means lies at the centre of the range over which normal vigorous growth is possible. For *C. musæ* this 75 per cent. maximum range lies between 18 degrees and 29 degrees C.

It is obvious that, in Queensland, summer temperatures are those most suited to leaf-spot development. As soon as the average daily temperature approaches the 18 degree C. line there is a marked falling-off in leaf-spot development. During the five or six cooler months—from May to October—the disease is practically at a standstill. This quiescence is aided by the fact that these months are also the driest. The infection occurring in July, 1933, is of interest. A period of effectual rainfall commencing on 10th July and supplemented by further showery weather and high humidities chanced to coincide with a period of abnormally high temperature, with the result that a moderate incidence of leaf spot developed in late spring. According to leaf records, it is very unlikely that the streaks recorded for October were due to infection later than this July period.

Although infection and development of the fungus is at a minimum during the cooler months, there is a somewhat paradoxical position created by the effect of the disease on the plant appearing at its maximum during these months. Quite a lot of the infection occurring during the summer months does not make its appearance in the brown stage until April or later, and it is not until this stage is reached that the disease can be considered an agent in leaf destruction. With the advent of cooler weather, the rate of leaf production decreases considerably, so that the replacement of diseased leaves by younger healthy ones is of little consequence and a greater proportion of the plant's total leaf area is destroyed. In the case of the older plants, the most prolific bunching takes place in Southern Queensland from December to March. Those bunches thrown during February and March, and possibly some of the earlier ones, will not mature until well into the winter. The last leaves of these plants pass through their suceptible period during the time of maximum leaf-spot activity in January and February, and consequently are liable to heavy infection. This results in the death of these leaves during the autumn and winter months, with the resulting spectacle at this time of bunches hanging from plants which are practically devoid of leaves.

Another temperature effect, and one which was brought out also in the artificial inoculation experiments, is the lengthening, as temperature falls, of the minimum incubation period required between germination and the appearance of the streak stage. The maximum period taken for the streaks to develop is also extended in the same way. For example, the minimum incubation period for January and February infection is approximately a month, and the maximum seven to nine weeks. Later in the year the minimum may be as long as, or longer than, the previous maximum, and the maximum itself extends to three and a-half months.

The time taken for the streak to pass into the brown stage does not appear to be so definitely related to seasonal temperature, which suggests there is little further vegetative growth on the part of the fungus associated with the transition to this stage.

The trend of temperatures over some periods in 1933 was higher than in 1934, and this is reflected in a shortening of the developmental periods in certain cases in the former year as compared with the latter.

There is also an indication of another temperature reaction which cannot at the present time be definitely established. This is the suggestion that the transition from the streak to the brown stage is stimulated by a sudden fall in temperature. It will be noted that the points at which 50 per cent. or more of the streaks of any one infection have passed to the brown stage is preceded in most cases by a fairly substantial fall in temperature. It is conceivable that with a tropical plant like the banana a sudden drop in temperature would affect the physiological activity of the tissues. Jones (1938) has shown that a sudden drop in soil temperature induces definite physiological changes in the gardenia plant, including a rapid senescence of the older leaves. A similar effect, if less pronounced, may occur in the case of the banana.

Application of Data to Spraying Procedure.

The observations discussed in the preceding paragraphs cover only a two-year period which, however, included years of distinctly different rainfall and temperature types. The information derived from them can therefore be considered reasonably reliable and has a very direct bearing on the conduct of a spraying programme. Simmonds (1933), as a result of indirect experiments carried out in 1930, suggested the association of heavy outbreaks of leaf spot with periods of prolonged rainfall and high humidity occurring five to seven weeks previously. A period of delayed development, rather than a cumulative multiplication, was considered to account for the long interval between the infection point and the epidemic outbreak. This hypothesis has been confirmed by the present investigation. Leaf-spotting appears to result from a series of distinct germination points closely related to rainfall. The early streak stages resulting from a single infection period do not necessarily appear together, but may appear in a series of more or less marked waves, giving a false impression of a multiplication of infection points. The period required from germination to the appearance of the first streak symptoms is rarely less than a month, and may extend during the autumn and winter to over three months, with the period for the production of the obvious necrotic brown stage even longer. This is very misleading from the point of view of timing applications of a fungicide.

In both 1933 and 1934 the last infection period which produced a noticeable wave of leaf-spot development occurred in early April. It is doubtful whether the amount of spot development in either of these cases was of sufficient consequence to merit consideration in the control programme. (At the peak of 3rd May, 1933, less than half the streak development was due to the April infection.) This would suggest that March would be the last month in which spraying would be justified, and even then earlier application would be of greater importance.

In the early part of the summer the first definite peak does not occur until January. There are several reasons for this. In the first place, temperature conditions are on the low side until October. Secondly, as a result of the long winter period of *Cercospora* inactivity, most of the affected leaves have reached the senescent stage by the time spring arrives. These die and are replaced by new healthy spring growth. Hence, by the time the weather is sufficiently warm for further fungus activity to take place, the source of spore inoculum is at a minimum and requires a little time to accumulate again. Furthermore,

the spring rainfall normally occurs as thunderstorms of short duration and is of the non-effectual type. Possibly, a December infection is the first to be taken seriously. However, the checking of earlier ones such as may occur in November, even though they be less severe, may serve a useful purpose in reducing the future source of inoculum.

There now remain for consideration the months of January and February. Without any doubt, these are the ones during which protection is most necessary under Queensland conditions. In both years the main outbreaks, apart from the first, could be traced to infections taking place in these two months. It is during January and February that temperature conditions are most favourable and the rainfall of the type most suited to infection.

Another question which comes up for consideration is the stage in the growth of the plants at which a supply of healthy leaves is most needed. As a result of the dormancy displayed by the fungus and the continued production of leaves, young plants usually have at least four to six green functioning leaves even when leaf spot is prevalent. This is apparently sufficient to carry the plant through the critical autumn and winter period until better conditions prevail. Once the bunch is thrown, the position is different. No further leaves are produced, and infection advances more or less rapidly, so that in an epidemic year the developing bunches may be left without any protection, and are then subject to sun-scald and poor development. It is therefore most important that the last half-dozen or so leaves appearing before the bunch should be ones protected from fungal invasion. Unfortunately, from this point of view, the normal tendency is for bunches to be produced more abundantly during that part of the year when leaf spot is at its worst. More than 50 per cent. of the year's total production of bunches may be expected to appear during the months of December to April, inclusive, and all of these are liable to more or less defoliation.

The rate of leaf production at different times of the year is of some importance. According to unpublished data kindly supplied by the Horticultural Section of the Division of Plant Industry (Research), this rate varies on well-grown plants from three to four leaves per month from November to February to not more than one a month in the middle of winter. Hence, provided infection periods are sufficiently widely spaced, any one application of fungicide made in the summer-time will protect a greater number of leaves than at any other time. On the other hand, if protective measures are not taken, a greater number will be available for infection at this time.

The information available with respect to the timing of sprays may now be summarised as follows:—

(1) The months during which serious infection is liable to occur are December to March, inclusive, with January and February the most important of the four. In certain seasons this period may also include the later half of November and the first half of April, although the developments having their origin in these two months can be expected to be definitely less extensive.

(2) The majority of bunches for which protection is required make their appearance during the months of December to April. Since serious early infection is unlikely, a fungicide applied to protect January bunches should normally be in time to protect December bunches also, and a prior application for them is rendered unnecessary.

(3) During the summer months, with a normal rate of leaf production, it would be necessary to apply a fungicide at intervals of between a week and a fortnight to ensure that all leaves are protected. This, of course, would be impracticable in most cases, and the number of applications has to be based on economic considerations. These are largely determined by the topography of the plantation, source of an adequate water supply, and the financial position of the grower.

According to the number of applications considered practicable, certain theoretical recommendations, based on the data contained in this paper, can be made regarding their timing. These are as follows:—

Four applications: Early December, early January, late January, late February.

Three applications: Early December, mid-January, and mid-February.

Two applications: Early January, early February.

Other applications, the advantage of which could scarcely be predicted without experimental evidence, are a spray in early November to reduce the initial source of inoculum, and one in March to reduce the latter end of summer infection.

The theoretical recommendations given above receive some practical confirmation from a report by Magee and Foster (1938) on spraying experiments recently carried out by them in New South Wales. The spray used was 4-4-40 Bordeaux mixture + Agral III. and was applied so as to cover the lower surface of the two youngest leaves. Excellent control of leaf spot was obtained by monthly applications from mid-December to mid-April. Good control was obtained by applications in January and February. Only fair control was obtained by applications in January and April; December, February, and April; and December, March, and May. In the last three schedules it is evident that the important period of January and February was neglected for periods when infection is normally light. It is understood that further experiments are projected in New South Wales, and it will be of interest to see how much further theoretical deduction will be borne out in practice.

In spraying the banana plant, it is useful to remember that the smaller amount of infection occurring on the upper surface allows the operator to neglect this and concentrate on covering the lower surfaces. The application can be further simplified by spraying not more than the four youngest leaves, as serious infection of any older than these is unlikely. Once the bunch has emerged and all young leaves have been satisfactorily sprayed, it is doubtful whether any further benefit will be obtained by covering the leaves a second time. The leaves should be resistant to attack by the time the spray is washed off them. Only those plants likely to bunch during the months of December to April, inclusive, need receive a spray.

Acknowledgment.

Very grateful acknowledgment is made of the valuable assistance rendered by Mr. F. J. Calvert, formerly of Mount Mellum, in connection with this work. The meteorological records for which he was entirely responsible form the basis on which the discussion rests.

Summary.

The influence of meteorological and seasonal factors on the development of banana leaf spot (*Cercospora musæ*) is discussed for conditions in Southern Queensland. The discussion is based on artificial inoculation experiments and field observations, the results of which are presented graphically, together with the relevant meteorological data.

The effect of temperature, in a broad sense, is to limit the activity of the fungus to the warmer months of the year. It also determines the length of the dormancy period, during which evidence of the presence of the parasite in the form of necrotic symptoms is absent. The type of rainfall is the factor determining the actual infection rate, and, to be effectual for germination, rain must fall more or less continuously throughout at least one day.

The peak outbreaks of the disease have been traced to their probable infection date, and on the data thus obtained theoretical recommendations are made with respect to the timing of sprays. January and February are the months in which control measures are most necessary.

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Fodder Conservation Scheme on the Atherton Tableland.

L. WOOD, Field Assistant.

DETERIORATION of pastures on the Atherton Tableland during the past fifteen years has become a matter of deep concern to the dairy industry. Officers of the Department who have made a close study of this problem are of the opinion that the damage to a large extent is caused by a white grub, the larvæ of a scarabæid beetle. The grub, being a voracious feeder, attacks the grass roots during its feeding stage, which extends over a period of approximately twenty months. So great is the resultant damage to the pastures that acre after acre of dead grass and bare patches may be observed throughout the affected areas.

The necessity for fodder conservation on a wide scale, as a consequence, becomes more and more evident as infestation extends. Having this in mind, and with a view to assisting farmers in the affected areas in the construction of silos, the Government stationed an officer in the district to specially advise and assist in this work. As the construction of a silo presents difficulties to the average farmer, often because of the lack of definite constructional details, this assistance is appreciated accordingly.

The concrete collar type of silo is regarded as the most suitable for the Atherton Tableland, which is composed mostly of red volcanic soil to a depth well below that required for a pit silo. This type, being much cheaper and simpler in construction, is, naturally, preferred to the tower silo in localities where the soil and subsoil are suitable. This can be determined by an examination of a well in the vicinity and the strata through which it has been sunk, or by boring. The suitability of the soil in which it is proposed to construct a concrete collar type of pit silo is obviously of first importance, for the possibility of the pit caving in must be considered. Following are the particulars of the actual construction of such a silo:—

The sinking of the pit presents the biggest difficulty, because of the scarcity of suitable labour. The labour cost, which includes the placing of the concrete collar, the erection of the covering shed, and the sinking of the pit, is approximately £36; but much of this outlay can be saved if the farmer does the work himself.

A shed covering, 8 feet high, 24 feet long, and 18 feet wide erected over the pit is necessary as a protection from weather, especially during the wet season.

To facilitate the digging of the pit, and the emptying of the silo when filled and as required, a hoist is placed in position under the shed. This hoist is usually hinged on to one of the posts or pivoted to a heavy sill-piece, to allow it to swing over the pit and around to the outside of the shed, as illustrated (Plate 266).

When sinking the pit, the earth, or spoil, is hoisted out of it in a large drum with a hinged bottom and a lever catch attachment. The drum full of spoil is pulled to the surface by a horse, lifted clear of the

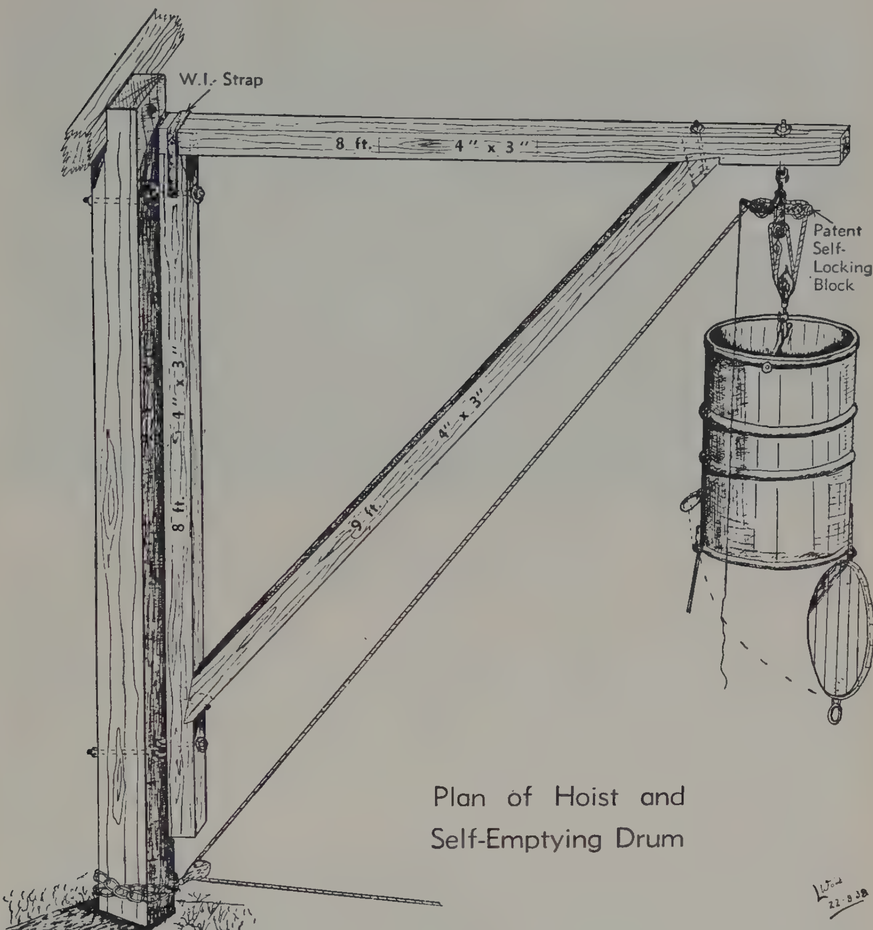


Plate 266.

pit, and, while the drum is suspended in the air, the catch is released, the hinged bottom of the drum drops, and the contents are deposited on a dray or where it may be easily removed afterwards with a horse and scoop (Plate 267).

With the hoisting gear is a patent self-locking pulley which locks and keeps the load in any position without tying or holding the hoisting rope, as the locking device comes into action the moment the rope is slackened. This self-locking block ensures safety for the man working in the pit.

Moulds for use in the concrete work have been made available by the Department, and the only cost to the farmer for their use is for transport.

The moulds designed for the construction of silos are built in sections 5 feet 3 inches long and 3 feet high, having eight inside and eight outside sections, which are bolted together to form a circle 14 feet in diameter and 4 inches thick.

Plate 267.
REMOVING THE SOIL FROM THE PIT WITH HORSE AND DRAY ON THE PROPERTY OF T. M. BRADY, MALANDA.

In constructing a silo, it is necessary to first mark out a circle 14 feet 8 inches in diameter and excavate this to a depth of approximately 4 feet. This depth is usually sufficient to ensure that the collar is placed well below the loose surface soil. The ultimate depth of the pit is usually twice the diameter—that is, a pit 14 feet in diameter should be, say, 28 feet deep.

In excavating the pit, it is best to allow 3 or 4 inches of the wall to be removed in the trimming.

To trim the walls, a piece of timber is placed across the diameter of the excavation, and held in position with pegs. Through this timber a

Plate 268.
TRIMMING THE PIT.

Plate 269.
The Moulds in Course of Removal, G. Waugh's Farm, Peeramon.

hole is bored to allow a length of piping to be placed vertically in the centre of the pit. A board half the diameter of the desired excavation in length is then made to revolve around the pipe, which is kept plumb. This board acts as a guide or indicator, so that the walls may be trimmed perfectly true with a sharp mattock or old adze, as illustrated (Plate 268). When the walls have been trimmed and the bottom of the pit levelled, the inside set of moulds is placed in position and filled with concrete.

Plate 270.
Covering Shed in course of Construction, J. Aitcheson's, Kulara.

If handled carefully, the moulds may be removed the following day, and be set up for the next lift and filled again. It is not necessary to use the outside set of moulds until the top of the pit is reached (Plate 269). When both sets of moulds are used, it is necessary to place spacing pieces between to ensure that the correct thickness of the wall is maintained. After the moulds have been removed, a circular wall of concrete 4 inches thick, 14 feet in diameter, 1 foot 6 inches above and 4 feet below ground-level remains. This forms the top collar of the pit.

The erection of the shed covering is now proceeded with, and provision should be made to allow space at one end of the shed to give some protection from the weather for the workmen engaged in filling

Plate 271.
HOIST IN POSITION ABOVE THE SILO, G. WAUGH'S FARM, PEERAMON.

and emptying the silo. It was found that a shed 18 feet wide, 24 feet long, and 8 feet high with a gable roof proved quite satisfactory and not too expensive, as well as having the advantage of being quite easily extended if necessary (Plate 270). As previously mentioned, a hoist is erected under the shed and over the silo to facilitate the sinking of the pit and the emptying of the silo (Plate 271).

The cost of the material required for the construction of the concrete collar, shed, and hoist amounted to approximately £37 10s. As crushed metal was very difficult to obtain, river gravel was used in proportion of 6 parts gravel to 1 part cement, which is quite a satisfactory mixture. The following is a detailed list of the material used and its cost. Allowance should, of course, be made for price variations for material in different districts. These figures are merely given as a general guide.

		£	s.	d.
For Shed—				
Posts, 5 x 5—9/10 ft.				
Plates, 4 x 3—2/18 ft., 2/24 ft.				
Rafters, 4 x 2—20/10 ft.				
Corner braces, 4 x 2—4/10 ft.				
Collar-ties, 4 x 2—4/12 ft.	at 42s. 6d.			
Roof braces, 3 x 1½—4/14 ft.	per 100			
Roof battens, 3 x 1½—8/25 ft.	super			
Fascias, 7 x 1—2/25 ft., 4/10 ft.		13	14	6
Ridge board, 7 x 1—1/25 ft.				
Hoist, 4 x 3—2/8 ft., 1/9 ft.				
28 sheets, 10 ft. iron; at 6s. 5d. per sheet		8	19	8
Ridgecapping, 5 lengths, at 2s. 11d. length		0	14	7
Nails, Springhead, 5 lb.				
Nails, 3 x 9, 5 lb.		0	6	5
Nails, 4 x 8, 3 lb.				
Bolts for posts, 9/5½ in. x ½ in.				
Bolts for "C" ties, 8/4½ in. x ⅜ in.		0	13	2
Hook and eyebolts for hoist				
Wrought iron strap for hoist				
Concrete Collar—				
18 bags cement, at 7s. 3d. per bag		6	10	6
4 cubic yards gravel at 12s. per yard		2	8	0
30 yards "K" wire-netting reinforcement		1	0	6
		£37	10	4

To fill a silo 14 feet in diameter and 28 feet deep, 80 tons of green fodder is necessary. The most satisfactory crop combination for this purpose is maize and cowpea, sown together and harvested when the grain becomes glazed and is just in the doughy stage. The reason for a legume-maize mixture is that the legume adds valuable protein to the mixture and so increases its nutritive value (Plate 272).

Plate 272.

Maize and Cowpea in Combination on J. Killoran's Farm, East Barron.—This crop went 16 tons to the acre.

If it is found necessary to grow the cowpeas separately from the maize, it is essential that the two be chaffed together, as the legume will rot if it is ensiled in layers, because it does not contain enough carbohydrates to create fermentation.

In cutting the crop, it was found that two men using cane knives were able to cut as much material in a few hours as it was convenient to chaff up each day. The cut material is transported to the silo by a

Plate 273.
CHAFFING THE CROP FOR SILAGE, H. JOY'S PROPERTY, YUNGABURRA.

horse and dray or slide (Plate 273). As it is not desirable that the silo be filled in less than ten days, this arrangement is quite suitable to most dairymen.

Perhaps by no other means could such timely action be taken to avert the economic consequences of a plague such as exists on the Tableland, and the farmers in the affected area are hopeful of a reasonable counterbalance for the pastures impoverished by the white grub.

That there is a keen appreciation of the advantages that may be gained by the construction of a silo is amply demonstrated by the response to the departmental assistance in the construction of over forty silos since the introduction of the scheme.

CHANGES OF ADDRESS.

Subscribers are asked to kindly notify changes of address to this Department without delay.

A Classification of Millets.

F. B. COLEMAN, Officer in Charge Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Investigation Branch.

ALTHOUGH some of the commonest crops sown by farmers in Queensland are included in the millet family, probably there is greater confusion with respect to naming and classification of the members of this family than is experienced with any other crop or group of crops.

Millet seeds of various kinds are often submitted for identification, and seed received is regularly misnamed by the sender. The word "Panicum" is commonly misused to cover practically all millets, and white panicum and Japanese millet are confused or incorrectly designated.

In order to simplify the classification of the millet family, a table has been drawn up giving the separate groups based on seed-head appearance, the scientific and common names, and using colour as a means of distinguishing between otherwise similar seeds.

MILLETS.

Botanical Names.	Common Names.	Colour of Seed.
FOXTAIL MILLET—		
Setaria italica Beauv.	**Giant Setaria** ..	Yellow
	Giant Panicum ..	..
	Liberty Millet ..	..
Setaria italica Beauv.	**Dwarf Setaria** ..	Yellow
	Hungarian Millet ..	..
	Panicum	..
**Setaria italica* var. *rubrofructa* Bailey ..	Siberian Millet ..	Red
	Kursk Millet ..	..
**Setaria italica* var. *stramineofructa* Bailey..	German Millet ..	Yellow
	Golden Wonder Millet	..
**Setaria italica* var.	Manchurian Millet ..	Yellow
**Setaria italica* var. *nigrofructa* Bailey ..	Brown-seeded Setaria	Brown to black
BARNYARD MILLET—		
Echinochloa crusgalli var. *edulis* Hitche syn. *Panicum frumentaceum* Roxb.	**White Panicum** ..	Creamy grey
	Billion Dollar Grass	..
	Sanwa Millet ..	..
	Teosin	..
	Siberian Millet ..	..
Echinochloa crusgalli var. *edulis* Hitche syn. *Panicum crus-galli* L.	**Japanese Millet** ..	Fawn
**Echinochloa colona* Link	Shama	Light fawn

* Not grown in Queensland.

The names in **heavy type** are the accepted common names in Queensland.

MILLETS—*continued.*

Botanical Names.	Common Names.	Colour of Seed.
MARESTAIL MILLET—		
Panicum miliaceum L.	**White French Millet**	White
	Proso Millet ..	..
	Hog Millet	..
	Broom-corn Millet ..	..
**Panicum miliaceum* L.	**Red French Millet** ..	Red
	Proso Millet ..	..
	Hog Millet	..
	Broom-corn Millet ..	..
**Panicum miliaceum* L	Other coloured French Millets	Black, brown, and green
	Proso Millet ..	..
	Hog Millet	..
	Broom-corn Millet ..	..
**Panicum miliare*	Eutki Millet ..	Dark grey
	Little Millet of India	..
CATSTAIL MILLET—		
Pennisetum glaucum R. Br.	**Pearl Millet** ..	Grey
	Pencillaria	..
	Egyptian Millet ..	..
	Mands Wonder ..	..
	Forage Plant ..	..
	Indian Millet ..	..
	African Millet ..	..
FINGER MILLET—		
**Eleusine coracana* Gaertn.	Ragi Millet ..	Red
BROOM SORGHUM—		
Sorghum vulgare Pers. var.	**Broom Millet** ..	Brown

* Not grown in Queensland.
The names in **heavy type** are the accepted common names in Queensland.

The expressions Foxtail, Barnyard, Marestail, Catstail, Finger, and Broom Sorghum are indicative of the "groups" into which the particular millets fall.

Of course, the colours indicated are only approximate, and relate to freshly-harvested seed.

See the March, 1938, *Queensland Agricultural Journal* for further information relative to Giant and Dwarf Setaria (Panicum).

Plate 274.

A. B. C. D. E.

A. Dwarf Setaria (Hungarian Millet).
B. Giant Setaria (Giant Panicum).
C. White Panicum.
D. Japanese Millet.
E. White French Millet.

Hoary Cress (*Lepidium draba*), a possible Serious Weed Pest in Queensland.

C. T. WHITE, Government Botanist.

SPECIMENS have recently been received at the Department of Agriculture and Stock of Hoary Cress (*Lepidium draba*) from the Darling Downs. This is a very serious weed pest in the wheatfields of the Southern States, and illustrations and a description of it are given herewith so that farmers may recognise it should it make an appearance on their properties. It is possible that the climate of Queensland may be too warm for its general spread, but, if it gradually becomes acclimatised, it certainly has great possibilities as a most serious pest.

Plate 275.
HOARY CRESS PLANT AND FLOWER.

Description.—Hoary Cress is a perennial weed characterised by the possession of long, white, underground runners, almost any part of which, when broken, is capable of forming a fresh plant. In the seedling stage, or early stages from sucker growth, it forms a rosette of leaves which are stalked. Later on, flowering stems, 1 foot to 18 inches—sometimes longer—are developed. These leafy flowering stems bear

leaves which are sessile—that is, not contracted at the base into a stalk. They are mostly 2 to 3 inches long and ½ to 1 inch wide. They are usually of a greyish-green colour, and are somewhat like cabbage leaves on a small scale, though much thinner in texture. The flowers are small, white, and are borne in great abundance. Each individual flower possesses four petals. The seed capsules are about one-eighth inch across and are divided into two compartments. The seeds are about one-twelfth inch long, are broad and flatly egg-shaped, dark-brown to purplish in colour, and have a full surface.

Distribution.—The plant is a native of Europe and Western Asia, but is now naturalised in most temperate countries. It is a very serious weed pest in parts of England, but is generally regarded as a naturalised alien there, and is thought to have been introduced in 1809 by troops returning from the continent.

Plate 276.
The Seed Head of Hoary Cress; Inset, a Seed Pod.

Botanical Name.—*Lepidium* (from the Greek *lepis*, a scale, referring to the seed-pods, which are small and scale-like). *Draba* is the name of an allied genus of plants. The word is a Greek one meaning acrid or biting, and refers to the biting taste of many plants of this family.

Properties.—In the Southern States the plant is regarded as having very little value for fodder. Should it be eaten by stock, it is likely to give a turnip or mustard flavour to milk and cream. It is not known to possess any poisonous or harmful properties.

Eradication.—The plant has been subject to investigation by Mr. A. Morgan, Weeds Research Officer of the Victorian Department of Agriculture, and illustrations and some observations are taken from an article by him in the "Journal of Agriculture of Victoria," January, 1934.*

* "Hoary Cress Control," by A. Morgan, B.Agr.Sc., Weeds Research Officer, Department of Agriculture, Victoria—*The Journal of the Department of Agriculture of Victoria,* Vol. XXXII., Part I., page 1, January, 1934.

In this article Mr. Morgan states: "There are five available methods of control, each of which has particular value under certain conditions, which will be outlined briefly. The methods are:—

(*a*) Persistent regular cultivation;
(*b*) Salting;
(*c*) Carbon bisulphide;
(*d*) Chemical herbicides, particularly arsenicals, applied as sprays; and
(*e*) Plant competition."

Cultivation.—In experiments at the State Research Farm, Werribee, shallow fortnightly cultivations, using a weed-knife attached to a cultivator, caused the death of all plants after the treatment had been persisted with for two years. Naturally, this method, because of the time and labour involved, can be used only on small areas, and in circumstances where ordinary routine is not seriously interfered with. The process is one of slow starvation of the plants, and there does not appear to be any means of reducing the amount of work involved. In very small patches the plants could be cut down with the hoe instead of the cultivator. *Ordinary cultivation stimulates the growth of the weed*, and, because of the danger of distributing roots over clean ground, it is advisable to refrain from cultivating such patches.

Salting.—In dry-farming areas having reasonably permeable subsoil, salting is the most satisfactory method of attack when a suitable cultivation programme cannot be carried on. The amount per acre required varies greatly with the density of the infestation. In small patches it is better to dose each plant showing with a small shovelful of salt. Plants which reappear should be treated in a similar manner, and it is necessary to examine the soil at intervals and resalt the few extraordinarily persistent plants which do not yield readily to the treatment. The second and successive applications, if done within reasonable time (up to two months), do not present a formidable problem.

The quantity of salt required will vary according to the density of the infestation—from 5 tons per acre upwards. A patch of 10 yards by 10 yards of moderately dense infestation, will require about two bags of salt for the first treatment. As with cultivation, the treatment, to be successful, must be persevered with. The salt, naturally, has a deleterious effect on the soil, but this is not necessarily permanent, and at Werribee it has been noted that a particularly good crop was obtained on salted areas five years after salting.

Carbon Bisulphide.—Carbon bisulphide, a volatile liquid, familiar on account of its use in rabbit extermination, may be used effectively against Hoary Cress in soils which are sufficiently permeable. Another essential is that the soil should be reasonably dry, but not so dry as to allow the escape of the gas formed. A rapid diffusion of the gas is to be aimed at; if the diffusion is too slow, the concentration of the gas in the soil air, a few inches away from the bores, may not be sufficient to kill the roots. The usual procedure is to bore or punch holes to 18 inches deep, 18 inches to 2 feet apart each way, pour in 1½ to 2 oz. of carbon bisulphide, and seal the hole immediately.

This is probably the most expensive weed eradicant in modern use, but in small patches under good conditions its effectiveness justifies the

expenditure. Some economy may be effected in very porous soils either by reducing the dosage per hole or by putting the holes down at greater distances apart; the limits of adjustment in these directions can be determined with certainty for the particular conditions only by experiment.

This treatment is useless under irrigation conditions, or near drains or dams. If the holes be put in too deep, the bisulphide gas, which is heavier than air, although it kills the roots at a certain depth, may leave untouched roots near the ground surface. These quickly re-enter the sub-soil, since carbon bisulphide exercises no permanent poisoning effect on the soil.

Plate 277.
A Suitable Spray Pump.

Chemical Sprays.—Mr. Morgan found, under conditions at Werribee, that the arsenical sprays were more satisfactory than the chlorates, and recommended a 6 per cent. solution of arsenic pentoxide applied as a misty spray. More recently, however, he advised the use of an arsenite spray (known as Craft's acid arsenical) as being cheaper and equally effective. A stock solution is made by mixing 4 lb. of white arsenic and 1 lb. of caustic soda in $2\frac{1}{2}$ pints of water, stirring until dissolved, the spray solution being prepared by making up 1 part of stock solution in 100 of water, and adding slowly, and with constant stirring, 5 parts of sulphuric acid.

In England, H. C. Long, in "Weeds of Arable Land," published by the Ministry of Agriculture and Fisheries, states that farmers have been successful in treating the weed there with solutions of copper sulphate and sulphate of ammonia. The latter is used at the rate of 2 cwt. sulphate of ammonia in 60 gallons of water.

Botanical Reference.—Lepidium draba Linnæus Species Plantarum 645, 17, 53.

Tomato Culture in Queensland.

H. J. FREEMAN, Senior Instructor in Fruit Culture.

THE tomato plant thrives under warm climatic conditions, and all the year round, in one district or another in Queensland, tomato-growing occupies an important place in rural economy. Fertile soil and abundant moisture are required for its successful cultivation, and, if these are not always present naturally, they may be supplied by judicious fertilizing and irrigation in one form or another.

The tomato has a wide range of uses; it may be eaten as a fresh fruit like an apple, sliced in salads, or it may be made into soups, sauces, pickles, jam, or used in other ways; while its possibilities for use in combination with other foods are only limited by the housewife's creative fancy.

Plate 278.

TRELLISED TOMATOES REQUIRING PRUNING.—Eight thousand plants to the acre.

Botanically, the tomato belongs to the family Solonaceæ. It is a near relative of the potato, and is susceptible to many of the diseases to which the potato is subject. Ordinarily it is easy to grow, but as a commercial field crop it requires care, skill, and an extensive knowledge of methods of disease control. Heavy crops are often obtained on newly burnt-off hillside scrub land, but, for continuity of commercial production, land which may be easily cultivated by either horse or motive power is desirable. Latterly, there has been a change-over from the old system of allowing the plants to grow naturally on the ground, in favour of trellising, and, although some excellent results have been and still are being obtained from the old system, staking and trellising are recommended because of the earlier maturity, better quality, and heavier yield of the resultant crops. In addition, a staked or trellised crop is easier to pick, as well as spray or dust for disease and pest control.

Plate 279.

Staked Break o' Day.—Showing a good crop.

As a protection against possible dry periods, irrigation in some form or other is important. The value of a good irrigation plant, therefore, cannot be too strongly stressed. The commercial grower also should be prepared to use precautionary and control sprays or dusts, in order to guard against several diseases and pests capable of ruining an entire crop.

In Queensland, there are three chief tomato-growing districts, each having its special season:—

(1) The Bowen district, specialising in a winter and spring crop;

(2) Stanthorpe, specialising in a summer crop;

(3) The coastal area from Rockhampton southwards and particularly in the south-east corner, specialising in spring, summer, and autumn crops.

Plate 280.

TRELLISED TOMATOES REQUIRING NO PRUNING.—Three thousand plants to the acre.

Soil Requirements.

Almost any reasonably good soil will grow tomatoes, provided the site is above frost-level and is sheltered from heavy winds. Good, well-drained, alluvial loams of average fertility and well supplied with humus to ensure the retention of moisture are best, but excellent crops also are produced on basaltic soils in elevated situations. Nitrogen is one of the essential elements for tomato-growing, but its presence in the soil in excessive quantity is not desirable, since it tends to over-development of the plant and foliage at the expense of the fruit. Excessive growth, being succulent, also is more subject to fungous disease attack. So that soil which by ordinary standards may be regarded as being very rich may not be so suitable as one of good average fertility and to which the right fertilizer can be supplied, when necessary, in the proper proportions.

Seed.

Perhaps, nothing is more essential to a successful tomato crop than good seeds, or plants from good seed stock. The best of planning and management and proper soil preparation will be of little use if inferior seeds or plants are used.

Many growers prefer to save their own seeds, claiming that thereby they know they are of the very best quality. This practice has much to recommend it, provided it is done properly. Selection of fruit for seed should be made, *not* from fruit in the packing shed, but while it is still on the plant. Points to be carefully noted as a guide are:—

(1) Mark plants showing prominently vigour and correct type of growth;

(2) Observe the profusion of blooms, both lower and top, and the adaptability of the plant to set fruit under local conditions;

(3) The capacity of the plant to carry the crop to maturity;

(4) The shape of the fruit and its carrying and ripening qualities;

(5) Select fully-matured late fruit from these special vines, the necessary records of which show them to be right up to standard.

There are several methods of preparing tomato seed, but for commercial growers either of the following is recommended:—

1. Select fully ripe fruit. Cut the fruit in halves and place it in tubs or kerosene tins. Place the full receptacles under cover and allow them to stand for five or six days, during which time rapid fermentation of the fruit will occur. Do not add water, as there is enough juice in the fruit to make a good liquid cover; tomato seed will not germinate while immersed within its own juice. On the sixth day skim off all floating seeds and fermented pulp. Pour the remainder into a fine sieve and wash several times under running water. What is left of fermented pulp will be washed away and fine, clean seed will remain. This seed should be dried in the shade and stored away in suitable containers in a dry room until required for use.
2. Use only full, ripe fruit. Cut the fruit in halves and squeeze it on to hessian or some similar material. Dry the squeezed pulp in the sun, and when all the moisture has evaporated from it, gather and rub it briskly to separate the seeds. Some winnowing will be necessary, after which the seed should be stored in a suitable container and kept in a dry place.

Ordinarily, 27 lb. of fruit is required to make up an ounce of commercial seed, which should produce approximately 2,000 plants.

Seed-beds.

Several methods of raising seedlings are practised, but perhaps the most common is to raise the plants in prepared seed-beds. Grown thus, the seedlings can be watered and cared for more easily than is possible when the seed is sown in the field. It is most important that the plants should be kept disease-free and vigorous, and, because of this, they should be regularly sprayed. Tomatoes are very susceptible to soil troubles,

such as nematodes and fusarium wilt; therefore, seed-beds should always be made on new soil. If necessary, the soil should be sterilised by one of the recognised methods before planting.

There are various ways of sterilising soil, such as by the use of formalin and cheshunt compound. Probably the most efficient way is to apply intense heat to the soil before sowing the seed. This method is described in detail in a departmental pamphlet—"Tobacco Growing in Queensland," from which the following paragraphs have been taken:—"Before further preparing the seed-beds for sowing, the soil should be sterilised. There are several methods of doing this—such as by steaming, the application of boiling water, solutions of formalin or similar agents; but the most effective in general estimation and recommended for Queensland growers is by the application of direct heat from the firing of tree branches, brushwood, or similar heat-giving material, piled on the beds to such an extent as will, when fired, produce sufficient heat in the soil to cook a 4-oz. potato buried 3 inches deep or an egg buried 5 inches deep. It is difficult to state the exact amount of material for burning purposes, but the equivalent of poles 3 inches in diameter laid side by side is regarded as likely to prove satisfactory. Successful sterilisation of the soil is most readily accomplished when the amount of moisture therein is what is regarded as satisfactory for cultural operations. Excess of moisture is as undersirable as deficiency, since in either case the penetration of the desired heat in the soil is less easily permitted.

Plate 281.

A GROUND CROP OF TOMATOES PLANTED 6 FEET BY 6 FEET, EQUAL TO 1,200 PLANTS TO THE ACRE.

"Properly burnt beds show a more or less reddish tinge of colour, while the soil is rendered more friable and breaks easily to a fine powder. The object of burning the beds as well as the soil for a couple of feet surrounding them is to destroy any fungus spores, weed seeds, insect or other life therein, that may cause damage to the young plants.

"The time to burn the seed-bed is preferably a few days or a week before it is desired to sow the seed.

"After the fire has burnt out and the soil has become sufficiently cool, all unburnt pieces of wood and large charcoal should be removed, and beds and paths, disarranged when placing the firing material thereon, trimmed up to proper shape. The fine ashes from the firing should now be thoroughly incorporated with the soil of the seed-beds, which at the same time should be reduced to the desired degree of fineness by digging and raking back and forth to a depth of 3 inches and finally levelled off."

Plate 282.
FURROW IRRIGATION IN A TRELLISED TOMATO PATCH.

It is not a wise policy to raise seedlings twice in succession in the same ground. Seed-beds should be made in sheltered positions, but open to the sun. They should be well dug and reduced to a fine tilth, and then allowed to stand a day or two to settle before planting. The beds should be thoroughly moistened before sowing the seed, thereby minimising the amount of watering necessary until the seedlings are showing above the surface of the bed. The seed should be sprinkled on the surface and covered lightly with sifted sandy loam, gently firmed by light pressure with a flat board. A light covering of dry straw assists germination by keeping the beds damp. The straw should be removed immediately the tiny seedlings appear above the ground. Only in extreme cases is the provision of shade necessary. Subsequent treatment consists of watering the beds when necessary, and spraying the young plants with Bordeaux mixture, 3-3-40 strength (increase strength to 4-4-40 once the plants have established themselves after transplanting), at regular intervals in order to keep the young growth covered. Most growers transplant when the young seedlings are from 6 to 8 inches high.

In districts marketing late winter and early spring crops, seed is usually sown during April and May. Where climatic conditions are suitable and irrigation available, seed may be sown almost at any time to provide for a continuity of harvest. Normally six weeks will lapse between the sowing of the seed and the planting out of the seedlings.

Transplanting.

Before setting the plants in the field, it is advisable to subject them to the process of "hardening off," which is done by withholding water for a week or ten days before removal from the seed-beds. As a result, the plants will tend to become tougher and will thus be better able to withstand the shock of transplanting.

Plate 283.

OVERHEAD IRRIGATION IN TRELLISED TOMATOES.—Note also the wire strainers on the end posts.

Two or three hours before digging the plants, the beds should be given a good watering to facilitate the removal of the plants without unduly damaging the roots. The plants should be kept moist and fresh while the planting proceeds. All leaves, except the undeveloped crown leaves, should be pinched or cut off to minimise transpiration until the root system is re-established. The best method of planting out is to dibble the holes and water in each plant. The plants should be set as nearly as possible at a depth ranging from 3 to 6 inches, according to the size of the seedlings. Transplanting provides an opportunity for the selection of the best plants and for discarding those which are small, spindly, or malformed. Only the best should be used. A well-grown plant is an important factor in the production of a profitable crop. In coastal areas south of Rockhampton it is almost impossible to successfully transplant tomato seedlings after the third week in June and before the last week in August.

A second method of planting tomatoes is to sow three or four seeds together direct in the field at the desired distances apart and in rows where the plants are to be grown. This system ensures that there are no broken roots to provide ingress for fusarium wilt, and the plants do not have to suffer the shock of transplanting. However, sufficient rainfall is always necessary to make satisfactory germination and growth, while attack from cutworms also has to be guarded against. The application of fungicidal sprays also is more difficult. If the grower is prepared to face these disadvantages, then planting direct in the field is recommended, particularly in districts where transplanting in June is necessary to harvest an early spring crop for the Southern markets. With a good strike, some thinning is necessary.

Plate 284.

Overhead Irrigation in Trellised Tomatoes.—Each nozzle delivers approximately 10 gallons an hour.

Possibly the most efficient method of all for the grower who will take the trouble to avoid every risk is to prepare tubes of bitumen roofing material and grow the seedlings in these. The procedure is as follows:—Wooden trays are constructed about 3 feet by 2 feet to hold the tubes. The tubes are made of pieces of bitumen roofing material rolled up and held together by a loop of string. One end should be plugged. The grower from whom this idea originated uses plugs cast in cement, but short pieces of round timber would do equally well. The tubes should be filled with compost and stood upright in the trays, and two or three seeds put in each.

The first advantage of this method is readily apparent, for the trays of seedlings can be kept clear of cutworms and other pests, and, if necessary, carried to shelter during inclement weather. When the seedlings have produced their first rough leaves, the trays are carried

to the plot, a hole dibbled, the plug removed, leaving the plant with its roots quite undisturbed *in situ*. Eventually one plant only is left, the remainder being pinched out.

The second advantage is that the seedlings can be planted out safely in any reasonable weather, since the roots suffer no disturbance and, remaining unbroken, are less liable to be attacked by wilt. By the time of planting, the plants also shall have attained a fair size and risk of loss from pests is less.

It is claimed that tomatoes grown by this method are several weeks ahead of those planted in the usual way. The trays, tubes, and plugs will all last for years, and, since most of the preparation can be done during odd moments or on wet days, little extra trouble is really incurred. It is actually an adaptation of the gardener's practice of pricking out his seedlings into thumb pots or seed-boxes preparatory to planting them out in the flower-beds.

"Buck" Tomato Plants.

Quite recently attention has been directed to the necessity for culling out "buck" or unprofitable plants before transplanting. The term "buck" is applied to a class of plants known to exist in certain varieties, particularly in some Chinese types. As young seedlings, these plants are sturdier than the others, with short internodes and numerous leaves with small branches. Experience has shown that, if such a plant is allowed to grow, it develops a multitude of sturdy laterals, all producing distorted bud clusters, and at 6 inches high might have as many as twenty to thirty branches with distorted bud clusters. The crop produced is light, and generally each fruit is misshapen. Throughout the life of the plant the growth is somewhat dwarfed and the top growth remains quite rosetted. Against this, the desirable type of plant is less sturdy, but strong, with long internodes, with practically no laterals in the early stages, and has an open normal top growth. These plants produce the heaviest yields, and the fruit is true to type.

Douglas records that in New South Wales varieties—such as Intermediate, Paterson, Short, Australian Dwarf Red, Yellow Top, Salad's Special, and Planter's Favourite—produce up to 20 per cent. of "buck" plants.

Planting Systems and Pruning.

It is necessary to differentiate between the methods used for obtaining a quick crop off new scrub or lantana land and those adopted by established market gardeners. In the former case, the plants are usually set out 4 to 6 feet apart (approximately 2,000 plants to the acre) in roughly cultivated ground and are allowed to spread unpruned over the land. The same practice of allowing the plants to grow naturally is adopted by some growers working on cultivated tomato fields. In the Bowen district, where good land is plentiful, the plants are set out 10 ft. and 12 ft. apart, on the square, and allowed to grow without pruning. The objection, however, to growing tomatoes on the ground, is that the resulting crop may be anything from extremely good to a total failure, according to the weather, if water is unavailable, and disease and pest incidence. Much fruit is often lost through slug and insect damage, or is scalded through resting on the hot ground.

Plate 285.

DRAWING REPRESENTING THE MAIN STEM OF A TOMATO PLANT, AND ILLUSTRATING THE METHOD OF PRUNING.

In recent years, staking and trellising methods have found much favour, particularly on well-sheltered land.

Pruning the tomato consists of the removal of the laterals which arise from the bases of the leaves as soon as possible after their appearance, the leaves only being allowed to remain. This causes the production of fruiting growths from points on the main stem between the leaves.

Plate 285 illustrates a main stem of a tomato plant showing leaves and lateral growths ("A") arising from their bases. The laterals, when removed, cause the growth of the fruit-bearing shoots (shown as "B"). Pruning diverts the growth of the plant from the production of a lot of vegetative growth to the production of more and better fruit.

The fruit produced by either the staking or trellising methods is grown under the best possible conditions. Sprays and dusts for disease and pest control can be applied with greater economy and efficiency, the result being a high percentage of first-quality fruit and a heavier crop. Cultivation also can be continued close to the plants, thereby conserving moisture and suppressing all objectionable weed growth. There is a minimum risk of damage to the fruit, and the crop reaches maturity in advance of fruit grown on plants on the ground. Harvesting is quicker and more satisfactory, since the matured fruit ready to pick can be seen at a glance without having to pull the plants about. After the crop has been harvested, posts, stakes, and wiring can be removed and stacked until required for erection on another site the following season.

Staking.

Hardwood stakes are placed 15 to 18 inches apart in rows which are 3 feet 6 inches to 4 feet apart. Each stake should be 6 to 7 feet in length, and when driven into the soil should retain a height of at least 5 feet. At the distances stated, approximately 8,000 stakes are required to the acre, and, as one plant is set to each stake, a corresponding number of plants is required. The plants are trained from the outset to single stems. All lateral growths arising from the bases of the leaves are pinched out as soon after forming as possible, the leaves only being left (see Plate 285). The single stems are tied every 12 to 18 inches to the stake by strips of soft rag or binder twine. The ties are made loosely so as not to constrict the expanding stem and are positioned beneath a leaf. The actual action consists in passing the tying material round the plant stem immediately below a leaf, crossing it over itself, and then passing it round the stake twice before knotting, so that the plant is attached to the stake by the loops of a loosely made figure eight. The growing tip is pinched out when the plant reaches the top of the stake.

Trellising.

One method of trellising is to set heavy hardwood posts firmly in the ground 4 feet apart at opposite ends of the field. These are solidly stayed and bored to carry two plain wires of, say, 12-gauge. The top wire is strained at about 4 feet 6 inches high, while the lower is strained at approximately 1 foot from the ground. Good hardwood stakes bored and driven into the ground every 12 feet are all that are required for intermediate supports. The young plants are set out about 15 inches apart beneath the lower wire, trained to two stems, and enabled to

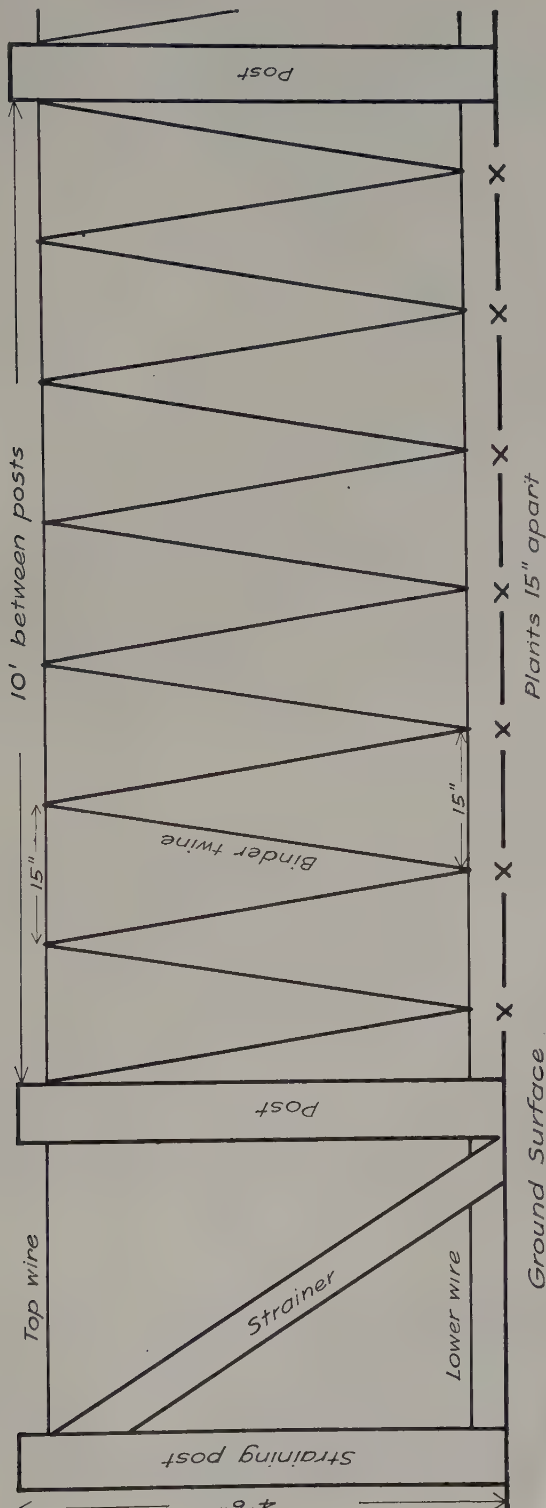


Plate 286.

Diagram showing Material required and how to Erect a Trellis for Tomatoes.

reach the top wire by means of strands of binder twine tied in "V" fashion as shown in Plates 278 and 286. By this method, the plants are pruned and the tips pinched out when the top wire is reached, as has been explained under the heading "Planting Systems and Pruning."

Another method of low trellising which obviates the necessity for pruning is set out hereunder. Reference should also be made to Plates 280 and 287.

At each end of the cultivated field place short hardwood posts 2 feet 6 inches in the ground and 2 feet 3 inches high, (4 feet 9 inches over all). These should be set at a slightly backward angle and be well stayed, to better stand the weight on the wires of the vines and fruit. Five feet is sufficient to allow between each row. Hardwood droppers (Plate 287, Fig. 3) 3 feet 3 inches in length should be placed in line and driven into the ground every 12 feet so that the actual height is 2 feet 3 inches, thus corresponding with the strainers at each end. Each dropper should have two holes bored through it—one almost at the top, and the other about 15 inches below the first. These holes need be only of ordinary nail-bit size (No. 5), being big enough to carry a short wire pin made from No. 10 or 12 gauge galvanised or steel wire. The wire pins (Fig. 4, Plate 287) carry the cross-arms. The top cross-arm (Fig. 1, Plate 287) should be 2 feet by 1½ inches by ½ inch sawn hardwood with the pin-hole in the centre and a ½-inch sawn slot in each end. The lower cross-arm (Fig. 2, Plate 287) should be 12 inches by 1½ inches by ½ inch sawn hardwood with a centre pinhole and a ½-inch sawn slot in each end. Two top wires are run from either side and very near the top of the strainers. Similarly, two wires are run from either side of the strainers at about 10 inches from the ground. The wires are strained tight, the cross-arms placed in position, and attached to each dropper with a wire pin, which is then bent over.

The plants are planted between the wires, spaced about 2 feet 6 inches to 3 feet apart (approximately 3,000 plants per acre). The first laterals are spread over the lower wires, and the later laterals over the top wires, and allowed to grow towards the ground again. No pruning is required, therefore the transmitting of disease by medium of the pruner's hands or knife is almost entirely avoided. Because of the greater number of laterals, heavier yields will be harvested, and the greater amount of foliage affords more protection for both fruit and soil, thereby ensuring greater soil moisture in the earlier stages and less sunburning in the latter stages of the crop. These plants, having more vigour, prolong the quality of the crop, for it is well known that, ordinarily, the last of a staked or trellised crop is not to be compared with the fruit marketed at the peak of the harvest. Further, all the material used in this system can be removed after the crop is finished and used again year after year for the same purpose.

Fertilizing.

As mentioned previously, the tomato does best in a soil of medium fertility which is well supplied with humus. The heavy application of stable manure alone tends to produce an excess of nitrogen, and, consequently, an abundance of succulent leaf growth at the expense of a satisfactory crop of fruit. This effect may be neutralised by the application of from 150 to 300 lb. of a mixture consisting of 2½ parts of superphosphate to 1 of sulphate of potash per acre. This will tend to counteract vine growth and materially increase the yield.

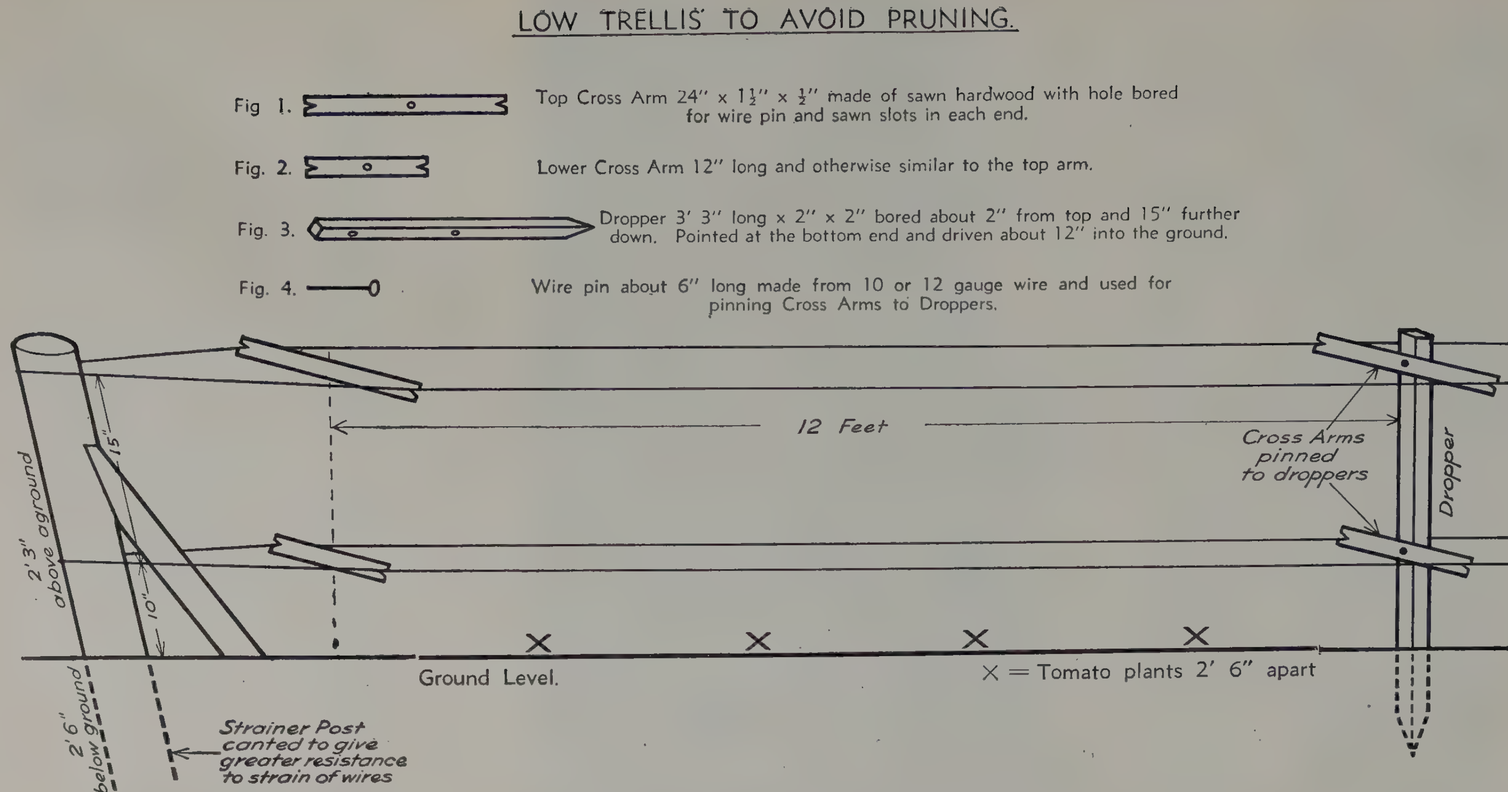

LOW TRELLIS TO AVOID PRUNING.
Fig 1. Top Cross Arm 24″ x 1½″ x ½″ made of sawn hardwood with hole bored for wire pin and sawn slots in each end.
Fig. 2. Lower Cross Arm 12″ long and otherwise similar to the top arm.
Fig. 3. Dropper 3′ 3″ long x 2″ x 2″ bored about 2″ from top and 15″ further down. Pointed at the bottom end and driven about 12″ into the ground.
Fig. 4. Wire pin about 6″ long made from 10 or 12 gauge wire and used for pinning Cross Arms to Droppers.
12 Feet
Cross Arms pinned to droppers
Dropper
15″
10″
2′ 3″ above aground
2′ 6″ below ground
Ground Level.
X = Tomato plants 2′ 6″ apart
Strainer Post canted to give greater resistance to strain of wires

Plate 287.

On average soils a complete fertilizer, such as 4-12-12 or 4-16-12, applied at the rate of 500 to 1,000 lb. to the acre, according to the degree of fertility, should prove most beneficial. Such a formula as 4-12-12 is obtained by mixing together 420 lb. sulphate of ammonia, 700 lb. of superphosphate, 560 lb. bonedust, and 560 lb. muriate of potash, to make 1 ton of fertilizer. The formula 4-16-12 would require a greater amount of superphosphate. The chief fertilizer firms supply ready-mixed fertilizer to these formulæ ordinarily, but under present war conditions a shortage of potash may necessitate some alteration in the potash percentage. In some tomato areas outside the State, potash has been eliminated entirely from tomato fertilizers. A mixture containing six parts of superphosphate and one part sulphate of ammonia, used at the rate of 560 lb. per acre before planting and 780 lb. as a top or side dressing when first fruit is about an inch in diameter, has given excellent results, and on new soils particularly this mixture is worthy of trial. The

Plate 288.

A Good Crop of Fruit on Trellised Vines.

fertilizer should be applied in the row and mixed well with the soil some days before setting the plants. A side or top dressing of from 500 to 700 lb. of sulphate of ammonia or nitrate of soda and superphosphate (1 part sulphate of ammonia or nitrate of soda to six parts of superphosphate) applied after the first fruits have set, in either one or two applications, is recommended for most soils. The more fertile loams and new basaltic areas require less fertilizer. For top-dressing, the fertilizer is broadcast in and around the plants and worked in with a dutch hoe. For side-dressing, the method is to open shallow furrows about 2 inches deep on both sides of the rows, about 9 inches from the plants, and apply the fertilizer along these small furrows, which should then be covered in with loose, friable soil, using a scarifier for this purpose. In average soils the application of lime to tomato ground does not seem directly to benefit the tomato crop, but is often beneficial to the soil and to other

crops planted in rotation. It is important that the humus content of the soil should be kept up, and rotating the land with green crops should be undertaken. In considering this, regard for nematode control arises, for, unfortunately, the tomato is highly susceptible to these soil inhabitants, and most of the areas devoted to market-gardening are infested to a varying degree. Non-susceptible green crops are, therefore, most desirable, and *Crotalaria goreensis* is recommended as a leguminous crop, in addition to, say, giant panicum and early-maturing varieties of maize.

Varieties.

New tomatoes are constantly being evolved and experimented with, and occasionally a particularly good variety is discovered. The Department of Agriculture and Stock is endeavouring to improve those at present grown and to better their resistance to diseases. There is a number of varieties which are more or less standard, and new growers, after ascertaining why preference is given locally to those most generally grown, would be wise to make a selection from these—

Early varieties.—Marvana, Earliana, Earliwinner, Kondine Red, Bonnie Best, Break o' Day, and June Pink.

Mid-season.—Marglobe, Burwood Prize, Pritchard, Bowen Buckeye, Norton, and Red Marhio.

Late varieties.—Targinnie Blue, Ponderosa, Australian Large Red, and Improved Stone. (Though very large, Ponderosa is not greatly favoured, on account of its irregular shape).

The following varieties are of wilt-resistant strains:—Break o' Day, Marglobe, Red Marhio, Bowen Buckeye, and Norton. Much has been said in favour of wilt-resistant varieties, and in districts subject to wilt damage more excessive plantings of these varieties is recommended.

Between the earliest and the latest maturing varieties in the one season is a difference of, approximately, thirty days—*i.e.*, if all plants were planted on the same date. Earliana is one of the quickest to mature, while Ponderosa usually is the slowest of the recognised commercial varieties.

Pests and Diseases.

In Queensland the main diseases affecting tomatoes are Irish blight, fusarium wilt, bacterial canker, target spot, septoria leaf spot, blossom-end rot, and the virus diseases spotted wilt, mosaic, and big bud. The more important pests of tomatoes include cutworms, corn-ear worm, green vegetable bug, Rutherglen bug, tomato mites, and nematodes.

Information regarding these and other pests and diseases is obtainable from the Under Secretary, Department of Agriculture and Stock, Brisbane.

The Packing of Lady Finger Bananas.

J. H. GREGORY, Instructor in Fruit Packing.

THE Lady Finger banana is a popular fruit on Southern markets, and for it satisfactory prices are usually obtained. Because of its smaller size, the quality of the fruit is considerably reduced if the method of breaking the hands into single fruits is adopted.

The most popular packing method is with full hands, contrasting sharply with the method of breaking into singles as with Cavendish bananas.

The illustrations with these notes show the method of packing clearly. The pack is governed by the size of the hands. Three packs are used to cover all sizes. The system of placing the fruit is the same in all packs, the difference being in the placing of the hands for fillers in the small sizes. The three packs are—

Small (Plate 289)—Single line of hands down the centre of the case placed crosswise, with a line of hands used as fillers on each side. The fillers are placed lengthwise in the case and in a way which will give the best results in making the pack firm and snug.

Medium (Plate 290)—Single line of hands placed across the case, but touching one side, with a layer of fillers down one side.

Large (Plate 291)—Single line of hands placed across the case.

The method of packing is to place the first layer of fruit shank end down (Plate 289).

The fruit is pressed together as tightly as possible without damaging or wrenching the shank ends. The top layer is then placed upon this with the shank end up (Plate 290).

Because of the irregularity of the shape of many of the hands, it will often be necessary to fill gaps. This should be done by using clusters of fruit, care being taken to avoid using singles or small clusters. The fruit of a lesser grade should be used for breaking into part hands for filling. With most sizes, two layers of fruit will fill the case.

The height of the fruit in the case may be varied when necessary by slightly tilting the hands. With the smallest fruit to bring the fruit to the correct height, a layer is placed in the middle of the case flat on the ends of the fruit in the bottom layer (Plate 291).

With extra large fruit, the top hands may be placed the reversed position to the bottom hands, to assist in lowering the height of the fruit in the case. To obtain the best pack, packers are advised to always place the most evenly shaped hands in the centre layers. The finished case should have the fruit slightly above the top of the case. This is eased into position before nailing down by gently bumping the ends of the case while holding the fruit in position; a short 3-inch by 2-inch board should be placed beneath the end of the case while this is being done. The use of a lidding press is unnecessary.

Plate 289.
BOTTOM LAYER, SHOWING PLACING OF HANDS WITH SHANK END DOWN.

Plate 290.
FINISHED CASE, SHOWING SHANK END PLACED UPWARDS.

Plate 291.
"SMALL" FRUIT PACKED, SHOWING A LAYER OF HANDS PLACED FLAT TO HEIGHTEN THE TOP LAYER, AS REQUIRED.

Plate 292.
FINISHED CASE OF SMALL FRUIT.

Plate 293.

FINISHED CASES OF LARGE AND MEDIUM FRUIT.

Acknowledgment.

Thanks are due to Mr. A. Want, of Yandina, for making available fruit and facilities for demonstrational purposes.

QUEENSLAND SHOW DATES FOR 1940.

The Queensland Chamber of Agricultural Societies has issued the following list of show dates for 1940:—

JANUARY.

Pittsworth Bushman's Carnival 29th

FEBRUARY.

Stanthorpe .... 1st to 3rd
Killarney .... 9th and 10th
Warwick .... 13th to 15th
Clifton .... 21st and 22nd
Allora .... 28th and 29th

MARCH.

Amiens 3rd
Goombungee 8th
Boonah Bushman's Carnival 25th
Oakey .... 27th and 28th

APRIL.

Pittsworth .... 2nd and 3rd
Toowoomba .... 15th to 18th
Dalby .... 22nd and 23rd
Kingaroy ...... 30th April and 1st and 2nd May
Tara .... 30th April and 1st May

MAY.

Yarraman .... 3rd, 4th, and 6th
Longreach .... 6th to 8th
Nanango .... 9th to 11th
Murgon .... 16th to 18th
Ipswich .... 21st to 24th
Kalbar 25th
Gympie ...... 30th and 31st and 1st June

JUNE.

Bundaberg .... 6th to 8th
Blackbutt .... 7th and 8th
Boonah .... 12th and 13th
Toogoolawah .... 28th and 29th

JULY.

Cleveland .... 12th and 13th

AUGUST.

Pine Rivers .... 2nd and 3rd
Caboolture .... 8th and 9th
Royal National, Brisbane ...... 12th to 17th

OCTOBER.

Warwick Rodeo .... 5th and 7th

Queensland Butter Production.

G. B. GALLWEY, Inspector of Accounts.

THE accompanying tables cover the operations of all butter factories in Queensland for the year ended the 30th June, 1939.

The make and pay figures are compiled from the monthly returns which each factory is required to furnish under *The Dairy Produce Acts*. Consequently, the figures show the total quantity of butter made by the factory and the quantity of each grade—actually the grades into which the butter has been made.

The pay figures show the total of butter paid for and the quantity of each particular grade for which the supplier has received payment.

There is a natural relationship between both sets of figures, and a scrutiny of them will show whether the quantity of butter manufactured in grades can be equitably reconciled with the quantity paid for in grades.

While it is admitted that it is not possible to make the same amount of butter as is paid for, the discrepancy as shown in many instances in these published figures suggests the consideration of necessary action by directorates and managements of dairy associations in respect of the correct grading of cream and the manufacture and payment for butter in accordance with the true grade.

The official gradings of butter show the result of the factory gradings when submitted to the Commonwealth and State graders.

The particulars also show that butter is graded in three grades at the factory and the percentages published indicate the quality of this butter which is true to grade when officially graded. The remainder is degraded, or in other words is not in the opinion of the graders correctly graded by the factory.

It should be noted that where no percentages are shown the factory has not submitted any butter of that grade for official grading.

The markets for which butter is graded are: Export, Brisbane, Interstate and East.

PRODUCTION AND PAYMENT FOR BUTTER IN GRADES AND OFFICIAL GRADINGS FOR THE 12 MONTHS ENDED, 30TH JUNE, 1939.

Factory.		Make and Pay in Lb.					Official Gradings.			
		Total.	Choice.	First.	Second.	Pastry.	——	Choice.	First.	Second.
								%	%	%
Caboolture	Made	3,383,298	3,126,202	256,368	728	..	True to grade ..	78·9	47·7	100
	Paid	3,381,995	3,192,073	187,854	2,068	..	..	..	..	..
Eumundi	Made	2,676,63	2,526,142	138,392	12,105	..	True to grade ..	83·3	56·4	91·9
	Paid	2,675,912	2,539,338	129,307	7,267	..	..	..	..	..
Pomona	Made	2,956,020	2,695,107	255,603	5,310	..	True to grade ..	25·9	70·6	100
	Paid	2,955,151	2,822,448	130,724	1,979	..	..	..	..	..
Esk	Made	2,849,072	1,476,185	1,140,817	232,070	..	True to grade ..	80·5	98	95·6
	Paid	2,848,996	1,524,447	1,149,903	174,646	..	..	..	..	..
Beaudesert	Made	4,600,358	3,981,492	618,866	..	..	True to grade ..	80·3	90·1	100
	Paid	4,600,428	4,071,512	523,992	4,924	..	..	..	..	..
Dayboro'	Made	456,717	21,301	410,664	24,752	..	True to grade ..	..	76·4	65·2
	Paid	456,884	304,166	137,071	15,647	..	..	..	..	..
Lowood	Made	796,105	542,778	230,057	23,270	..	True to grade ..	91·6	95·9	96·8
	Paid	796,531	637,262	142,369	16,900	..	..	..	..	..
Maleny	Made	2,614,505	2,530,617	41,496	42,392	..	True to grade ..	91·9	66·9	100
	Paid	2,613,389	2,538,716	55,848	18,825	..	..	..	..	..
Booval	Made	5,016,010	3,896,942	734,941	383,655	472	True to grade ..	84·3	95·5	100
	Paid	5,017,345	3,890,149	900,272	226,924	..	..	..	..	..
Boonah	Made	4,750,681	2,532,239	1,929,268	289,174	..	True to grade ..	62·9	97·8	98·6
	Paid	4,750,520	2,742,476	1,805,952	202,092	..	..	..	..	..

Grantham	Made	3,008,395	2,232,840	527,228	248,327	..	True to grade ..	69·6	85·7	98·2
	Paid	3,009,296	2,388,631	453,317	167,348	..	..	..	..	..
Laidley	Made	2,145,168	1,931,231	105,392	108,545	..	True to grade ..	85·2	94·6	96·7
	Paid	2,145,034	1,950,924	102,747	91,363	..	..	..	..	..
Kingston	Made	7,029,400	6,595,064	..	434,336	..	True to grade ..	87·1	..	100
	Paid	7,029,417	6,659,689	..	369,728	..	..	..	..	..
Woodford	Made	2,367,569	2,212,281	152,137	2,141	..	True to grade ..	70·5	93·8	100
	Paid	2,367,167	2,204,533	159,351	3,283	..	..	..	..	..
College	Made	105,070	98,518	5,096	1,456	..	True to grade ..	45·1	39·4	100
	Paid	105,082	89,638	13,615	1,829	..	..	..	..	..
Chinchilla	Made	3,091,588	1,543,132	1,074,360	474,096	..	True to grade ..	28	85·5	98·8
	Paid	3,094,539	1,790,982	971,804	331,753	..	..	..	..	..
Toowoomba	Made	6,038,606	4,794,454	918,064	326,088	..	True to grade ..	97·9	98·7	99·3
	Paid	6,046,691	4,804,333	917,236	325,122	..	..	..	..	..
Clifton	Made	1,610,172	1,118,436	439,712	52,024	..	True to grade ..	72·9	95·4	95·6
	Paid	1,610,176	1,126,871	437,564	45,741	..	..	..	..	..
Crow's Nest	Made	2,298,914	1,436,458	818,496	43,960	..	True to grade ..	67·7	95·1	96·6
	Paid	2,298,914	1,435,889	819,093	43,932	..	..	..	..	..
Dalby	Made	4,316,481	2,923,714	1,155,943	236,040	784	True to grade ..	93·9	95·2	98·8
	Paid	4,317,739	2,921,042	1,173,232	222,875	590	..	..	..	..
Goombungee	Made	2,325,284	1,586,532	602,336	136,416	..	True to grade ..	68·2	97·3	100
	Paid	2,325,284	1,593,721	603,561	127,999	..	..	..	..	..
Jandowae	Made	3,408,666	2,817,306	470,736	120,624	..	True to grade ..	76·11	85·2	97·5
	Paid	3,408,690	2,838,520	459,771	110,399	..	..	..	..	..
Miles	Made	1,772,289	556,193	1,107,792	108,304	..	True to grade ..	19·7	87·1	86·3
	Paid	1,772,972	556,362	1,108,260	108,350	..	..	..	..	..

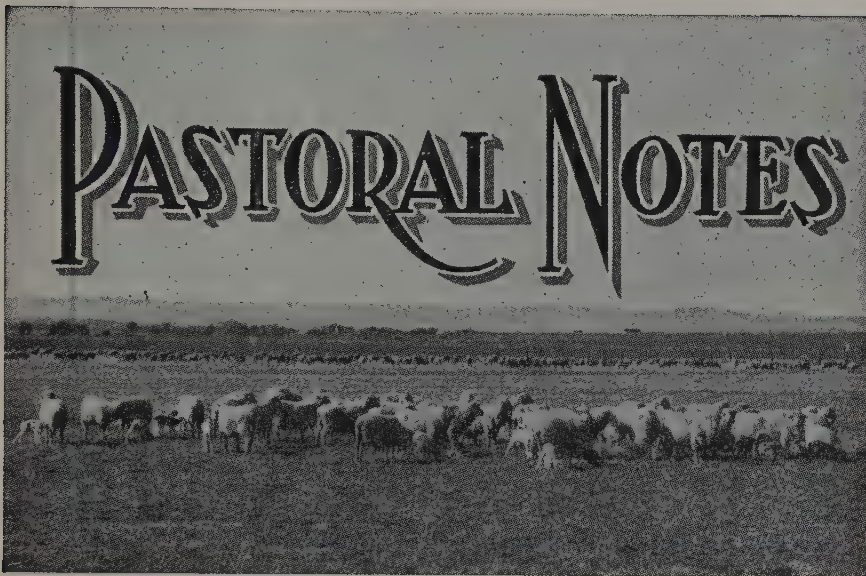
PRODUCTION AND PAYMENT FOR BUTTER IN GRADES AND OFFICIAL GRADINGS FOR THE 12 MONTHS ENDED, 30TH JUNE, 1939—*continued.*

Factory.		Make and Pay in Lb.					Official Gradings.			
		Total.	Choice.	First.	Second.	Pastry.	——	Choice.	First.	Second.
								%	%	%
Killarney	Made	1,633,988	1,066,354	444,602	123,032	..	True to grade ..	76·8	97	100
	Paid	1,633,931	1,091,974	449,193	92,764	..	..	..	..	..
Milmerran	Made	1,694,277	400,223	982,604	358,707	42,734	True to grade ..	75·9	95·1	88·2
	Paid	1,694,196	513,766	826,524	353,906	..	..	..	..	..
Oakey	Made	5,895,397	5,049,685	299,376	368,928	177,408	True to grade ..	70·2	87·4	69·6
	Paid	5,896,683	5,253,786	360,397	282,500	..	..	..	..	..
Roma	Made	1,284,101	..	804,237	479,864	..	True to grade ..	100	97·7	100
	Paid	1,283,847	155,597	729,411	398,541	298	..	..	..	..
Warwick	Made	3,481,023	2,507,583	587,768	385,672	..	True to grade ..	84·2	90·7	94·1
	Paid	3,478,773	2,507,340	619,803	351,630	..	..	..	..	..
Allora	Made	1,556,371	1,236,420	288,357	31,594	..	True to grade ..	93·4	93·7	98·9
	Paid	1,555,446	1,245,092	279,627	30,727	..	..	..	..	..
Texas	Made	281,076	11,944	215,596	53,536	..	True to grade ..	..	94	99·3
	Paid	280,838	92,993	139,234	48,611	..	..	..	..	..
Gayndah	Made	2,597,876	1,780,388	684,824	133,114	..	True to grade ..	82·2	87·2	98·9
	Paid	2,598,9[illegible]2	1,815,919	683,919	109,154	..	..	..	..	..
Biggenden	Made	3,152,841	2,599,449	521,696	31,696	..	True to grade ..	85·5	94·4	100
	Paid	3,152,271	2,678,740	459,831	13,700	..	..	..	..	..
Kingaroy	Made	5,819,631	5,230,936	353,208	235,487	..	True to grade ..	92·4	68·1	98·9
	Paid	5,823,732	5,342,701	315,818	165,213	..	..	..	..	..

Maryborough	Made	1,404,742	798,002	487,236	119,504	..	True to grade ..	72·6	98·6	94·2
	Paid	1,403,203	812,553	497,041	93,609	..	..	..	..	..
Mundubbera	Made	4,242,092	3,889,516	249,872	102,704	..	True to grade ..	58·7	44·1	97·9
	Paid	4,243,869	3,942,772	257,844	43,253	..	..	..	..	..
Wondai	Made	4,206,386	3,752,168	422,634	31,584	..	True to grade ..	84·9	69·5	93
	Paid	4,207,138	3,812,695	373,777	20,666	..	..	..	..	..
Nanango	Made	3,668,740	2,381,972	1,150,800	135,968	..	True to grade ..	43·9	94·1	95·3
	Paid	3,669,681	3,253,742	386,142	29,797	..	..	..	..	..
Murgon	Made	4,802,186	3,643,658	1,124,032	34,496	..	True to grade ..	86·7	98·1	100
	Paid	4,801,808	4,486,303	306,694	8,811	..	..	..	..	..
Proston	Made	2,167,198	1,790,150	340,592	36,456	..	True to grade ..	84·7	89·3	99·1
	Paid	2,165,343	1,892,139	258,188	15,016	..	..	..	..	..
Gympie	Made	8,765,788	8,160,596	499,520	105,672	..	True to grade ..	97·84	83·1	86·6
	Paid	8,767,124	8,274,507	414,069	78,548	..	..	..	..	..
Cooroy	Made	2,080,787	1,575,779	465,304	39,704	..	True to grade ..	93·3	98·7	98·2
	Paid	2,078,837	1,757,314	296,465	25,058	..	..	..	..	..
Gladstone	Made	3,522,333	550,225	1,804,721	1,167,387	..	True to grade ..	34·6	91·4	97·2
	Paid	3,548,292	448,123	2,091,053	1,009,116	..	..	..	..	..
Bil. e'a..	Made	3,325,707	318,813	2,368,550	638,344	..	True to grade ..	64·2	92·8	95·7
	Paid	3,326,980	442,149	2,290,381	594,450	..	..	..	..	..
Bundaberg	Made	2,510,497	456,603	1, 39,173	514,721	..	True to grade ..	..	97·8	91·8
	Paid	2,529,184	753,091	1,298,816	476,875	402	..	..	..	..
Mackay	Made	794,958	794,958	..	..	..	..	..	..	..
	Paid	787,274	682,516	64,224	40,514	20	..	..	..	..
Monto	Made	4,802,105	2,005,341	2,557,856	238,908	..	True to grade ..	75	91·9	84·3
	Paid	4,811,969	1,674,153	2,929,426	208,283	107	..	..	..	..

PRODUCTION AND PAYMENT FOR BUTTER IN GRADES AND OFFICIAL GRADINGS FOR THE 12 MONTHS ENDED, 30TH JUNE, 1939—*continued.*

Factory.		Make and Pay in Lb.					Official Gradings.			
		Total.	Choice.	First.	Second.	Pastry.	——	Choice.	First.	Second.
								%	%	%
Rockhampton ..	Made	2,718,606	1,892,790	432,656	380,784	12,376	True to grade ..	..	76·7	88·1
	Paid	2,735,071	638,564	1,721,667	363,104	11,736	..	..	..	..
Wowan	Made	3,162,523	209,130	2,144,240	809,153	..	True to grade ..	..	94·5	98·8
	Paid	3,139,462	693,256	1,718,532	727,674	..	..	..	..	..
Atherton	Made	3,202,390	3,195,340	..	7,050	..	True to grade ..	99·6	100	100
	Paid	3,202,896	3,187,757	..	15,139	..	..	..	..	..
Bushy Creek	Made	95,396	..	95,396	..	..	..	..	..	..
	Paid	95,411	..	95,411	..	..	..	..	..	..
Daintree	Made	171,380	..	170,441	..	939	..	..	..	..
	Paid	171,380	..	170,441	..	939	..	..	..	..
Ingham	Made	17,015	..	17,015	..	..	..	..	..	..
	Paid	19,065	..	19,065	..	..	..	..	..	..
Millaa Millaa	Made	1,087,036	1,064,938	..	22,098	..	True to grade ..	45·2	100	100
	Paid	1,086,325	1,065,801	..	20,524	..	..	..	..	..
Ravenshoe	Made	560,002	554,234	..	5,768	..	True to grade ..	100	76·9	100
	Paid	558,417	553,389	..	5,028	..	..	..	..	..
Silkwood	Made	56,080	7,087	42,206	..	6,787	True to grade ..	..	..	..
	Paid	56,483	7,132	42,517	..	6,834	..	..	..	..



Wounds in Horses—Simple Treatment.

The fundamental principle underlying all wound treatment is the provision of suitable downward drainage for the discharges from the wound. If such drainage is provided, then most wounds tend to heal well, but deep wounds penetrating downwards and which form pockets do not progress satisfactorily, for the reason that pus and discharges collect within them and cannot get away. Wounds which penetrate in an upward direction need little treatment, beyond ensuring that they remain open while healing from their deepest part and that they are reasonably clean on the surface. In the case, however, of downward penetrating wounds, it is necessary to use a knife judiciously in order to allow the discharge a free outflow.

Before any wound treatment is attempted, the injured edges of the wound should be clipped with scissors to remove the hair and reveal the true nature of the wound. The next thing to do is to wash the wound thoroughly with a warm, weak disinfectant solution. Then, if necessary, the depth of the wound can be explored with a blunt probe which has been boiled, or with the fingers after the hands have been thoroughly washed and scrubbed. Punctured wounds—such as nail or stake wounds—are always difficult to drain and often have to be opened up. Microbes are carried in when the foot is punctured, pus of a black liquid and foul smelling nature may gather in the foot, and may continue to accumulate because it cannot drain away. If that happens, acute lameness is certain to follow. If unattended, these corrupt fluids rise slowly above the level of the horn and eventually break out through the soft skin over the coronet; but by that time the structures within the foot are in a nasty mess and the case has become very serious.

To treat hoof punctures, the whole foot is cleaned and, if possible, it is held in a bucket of warm disinfectant solution to still further cleanse

it and also soften the horn. The sole of the foot is then pared away by making a cone-shaped hole at the point where pain is most acute. The apex of the cone must be carried right through the horn until blood or pus is revealed. The pus should then be allowed to drain away. To prevent the hole from closing, a pad soaked in a solution of iron perchloride should be placed in the wound, and the treatment should be repeated daily while necessary. If treated thoroughly in the way described little further attention is necessary.

THE MENACE OF GRASS FIRES.

After the great growing season we have had, it would be wise to give some thought to the menace of grass fires in nearly every district. The late winter, with its succession of hard frosts, helped in the drying out of paddocks.

In any case, strong growths of grass will soon dry out with the advance of summer, and unless fire outbreaks are prevented or properly controlled serious losses of stock and property are likely to happen. And these losses are not individual, they are felt throughout a community.

So it would be wise to look out for fires and form breaks where possible or necessary, as well as check up on all cases of careless use of fire. Campers and picnickers should also see that every fire they light is completely put out—that is just plain commonsense.

THE CORRIEDALE.

There is a bright future for the Corriedale in Queensland. Judged from any point of view this breed has, as in the other States, come to stay.

The Corriedale proper was evolved about sixty-five years ago by crossing the Lincoln with the merino. The breed is now regarded as purebred. A breed is said to be pure when it will reproduce its type with certainty.

The Corriedale will go further in Queensland than a general utility farmer's sheep. The time is fast approaching when this breed will be run extensively on marginal areas of the Darling Downs, and especially on much of the brigalow and belah country reclaimed from prickly-pear.

Some breeders in Queensland show a tendency to breed the Corriedale too fine. This is a mistake and, to some extent, nullifies the reasons for which the breed was evolved. Loss of size and constitution follow too fine a fleece.

The covering should be strong, somewhere about 54's-56's quality, and with strength must go length. A strong short wool is common, but is not desirable. The fleece should be bright. Scientific culling in a Corriedale flock should proceed from both ends as it were. Anything tending to too much Lincoln is undesirable, and anything showing too much of the merino type also should be rejected.

Conformation and size, too, are of great importance with this fast-improving breed.

Plate 294.
HOCK DEEP IN LUXURIOUS PASTURE.—Blood horses grazing, Rodney Downs, Western Queensland.

CARE OF SHEEP SKINS.

Want of care of the skins from sheep killed for mutton on the property is the cause of a loss, which if taken in the aggregate, is considerable.

Skins should be carefully removed from the carcase, using the knife as little as possible in the process, and dried in the shade.

There are three methods of treating sheep skins. A frame may be made with hooks in suitable places for stretching the skins; the skins may be stretched on a rail, placing neck and tail on the rail; or the floor of the shearing shed may be utilised, in which case the skin should be laid on the floor woolly side down. In all cases, the skins should be treated with an insecticide, a solution of one of the power dips being suitable.

When packing for market, skins should be packed wool to wool and skin to skin.

Be careful to keep valuable sheep dogs away from poisoned skins. Many a good dog when hungry has been lost by having free access to treated sheep skins.

PROFIT FOR THE SHEEP MAN.

It is admitted by those in a position to know that one of the more important retarding factors in the fat lamb industry is the meagre supply of cross-bred ewes. This applies not only in Queensland, but all over Australia.

Excellent crossbred ewe lambs, bred the right way, are regularly slaughtered as fat lambs. This is wrong in principle, although easily understood. Farmers generally are not in a position to refuse the remunerative figure offered. The opportunity exists, therefore, for the man further out, especially on some of that excellent country reclaimed from pear infestation, to join long-woolled rams with the robust type of merino, with the object of retaining the ewes of the drop for sale to fat lamb raisers nearer in and on the dearer country. The wethers of the drop should be disposed of as fat lambs.

The profits to a grazier adopting this policy are undoubted.

FARMERS' WOOL SCHEME.

Farmers consigning wool to the Department of Agriculture and Stock for classification and sale under the Farmers' Wool Scheme are advised to use good wool packs in preference to fadges and bags—if the quantity of wool consigned makes it practicable.

Notwithstanding the cost of purchase, the use of packs will actually result in a reduction of marketing costs. Firstly, bales weighing 200 lb. or over are charged at a lower railage rate than bales, fadges, or bags weighing less than 200 lb. Secondly, the cost of cartage of the wool from rail to the Department's store will also be reduced. Thirdly, if the wool is forwarded in good new packs, provided they are branded on the top only, they can be used by the Department in rebaling, and the

farmer is credited with their full value. If the condition of the packs does not permit of this being done, they can, if desired, be returned at a small cost (approximately 1s. a pack) to the farmer for use again in forwarding wool to the Department.

The object of the Farmers' Wool Scheme is to assist small growers, and any means whereby marketing costs can be reduced will, no doubt, be appreciated.

THE WOOL APPRAISEMENT SCHEME.

Woolgrowers of Queensland are by now aware of the fact that the British Government has purchased the whole of the clip for the duration of the war and one clip after the war at a standard price of 13·4d. per lb. Appraisement conditions make it particularly important that clips should receive expert treatment in the matter of correct classing before going to the show floors.

A badly classed clip will bring only the value of the lowest-priced wools in the line. On the other hand, a well-got-up clip will sell to advantage.

Greater care should be taken in the matter of yield, type, length, and colour in the fleece lines. With the possible shortage of wool packs in the future, growers are urged to make their bales heavier, thus effecting a saving in packs. Payment for wool will, as usual, be made a fortnight after appraisement.

Ten per cent. of the total purchase money is to be withheld until the completion of the season. Should the British Government sell wools to neutral countries or anyone else at a profit, the grower will benefit to the extent of 50 per cent. of such profit. Should a loss be sustained, Australia will not participate in that loss.

ROTATIONAL GRAZING.

The practice of grazing paddocks throughout the year according to a pre-arranged plan of rotation—although highly successful in countries with a reliable rainfall—is not practicable, as a general rule, in Queensland. The main object of rotational grazing—the regular provision of short, young grass—can, however, be achieved as far as weather conditions will permit by submitting each paddock to short and intermittent grazings, rather than to continuous grazing. In order that this practice of intermittent grazing may be applied in an efficient way, it is necessary to subdivide a fairly large number of paddocks, each of which may be grazed down by the available stock within a short period and then rested.

Broadly speaking, the system of management recommended for dairy pastures is to concentrate the producing stock on a paddock of young, leafy pasture for a few days, and when it has been eaten down fairly closely, transfer the stock to another paddock of young grass; and so on, coming back to the first paddock some weeks later, when good feed is again available on it.

Since the pasture in different paddocks may vary in its rate of growth, no definite orderly rotation may be possible, but each paddock may be grazed and spelled intermittently.

WATER SUPPLY PLAN.

On many grazing properties in Queensland there is sufficient surface water to last until June or July in a normal year, and possibly until August in a good year, when there has been a heavy wet season. There is a period between the time that the surface water dries up and the first storms fall in which it is necessary to provide water, either by well or bore.

When selecting a site for a well or a bore, the grazier should first make a survey of his country. A site should, if possible, be selected on a part of the property where cattle do not feed intensively when surface water is available. On a number of grazing properties the mistake has been made of putting down a bore in close proximity to surface water. As the surface water dries up, the grass in the immediate vicinity is also eaten out, and when it is necessary to pump water for stock there is often no grass anywhere near the bore or well. As a result, the stock are forced to walk long distances to grass.

When bores and wells are put down in places away from surface water, there will probably be grass near at hand in a dry time, and cattle will do better, drink oftener, and retain condition that they would otherwise lose through excessive walking.

CROSSBRED EWES FOR FAT LAMBS.

As 98 per cent. of the sheep population of the State are of the merino breed, Queensland farmers are obviously at some disadvantage in respect of the right type of ewe for the production of the early maturing spring lambs.

In this connection, fat lamb-raisers, who are using long wool rams—such as Romney Marsh, Border Leicester, or Lincoln—should, in their own interests, retain some, at least, of the ewe drop as future breeders in their flocks.

There is no doubt that from a strict money point of view such a practice would pay. While the cry is always that crossbred ewes of the right type are either expensive or unprocurable, year in and year out ewe lambs are slaughtered in Queensland, which, if kept for breeding purposes, would have a most beneficial effect on fat lamb production. If farmers are not in a position to hold all the ewe drop from the long wools, they should, at least, retain some proportion each year with the idea of eventually working into a crossbred flock.

BLIGHT IN CATTLE.

Blight in cattle may again become prevalent in the coastal areas of the State during the wet season.

This is a highly contagious disorder, and, apart from losing condition, many animals become blind. Treatment should be applied as soon as the trouble is noticed.

The following solution is very useful in treating the complaint:—

Nitrate of silver	3 grains
Sulphate of morphia	1 grain
Soft water	1 ounce

An alternative and less expensive remedy is a mixture of 2 per cent. zinc sulphate and 2 per cent. boracic acid in water that has been boiled.

All eye discharges should be washed from the face of the beast and vaseline applied to the area covered. The discharges attract flies; while flies continue to irritate the animal a cure will be long delayed, if not prevented entirely.

The affected eyes should be syringed in the early morning and late afternoon. A small bulb syringe is quite suitable for applying the solution.

SHEEP ON COASTAL COUNTRY.

Coastal farmers who are desirous of stocking sheep usually ask the question how to start to the best advantage. Conditions and circumstances along the coast vary so greatly that no hard and fast rules can be laid down.

It is usually considered that where dairying, pig raising, and mixed farming can be successfully combined in coastal areas the conditions are favourable for fat lamb raising. There is one chief guiding point, and that is, where the rainfall can be considered as excessive for the combination mentioned, it will be decidedly against the wellbeing of sheep.

For fat lamb raising the British breeds should be used. The most suitable of them is the Romney Marsh, and the wetter the conditions the nearer to the pure Romney Marsh the breeding flock should be. If crossbred or Corriedale ewes are not available, then strong-woolled, plain-bodied merino ewes should be introduced, to which should be mated pure Romney Marsh rams. Of the progeny, ewes should be retained for breeding and the wethers used for home consumption or sold as fat lambs. Merino ewes should not be retained on the coast for longer than two seasons.

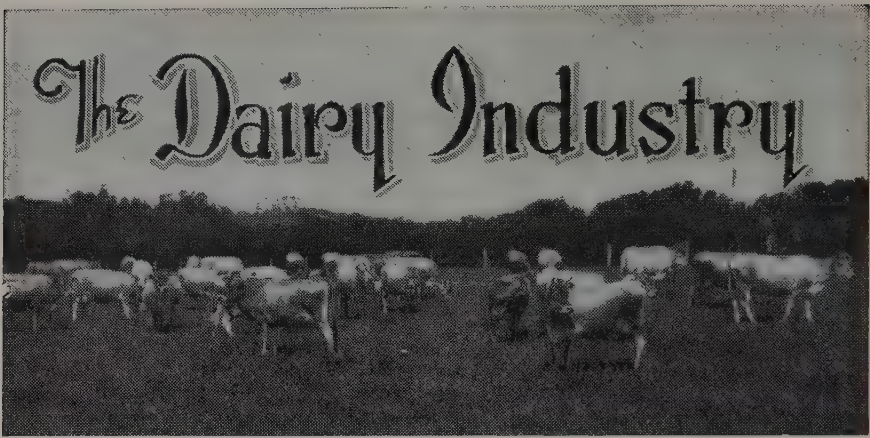
All lambs should be marked during August, and the ewes shorn in September. If the ewes are healthy and well fed from the time the lambs are dropped, all lambs that are to be sold should be fit before or during December. A month after the lambs are disposed of, the ewes that are to be sold should be fat and sold as such to secure best results. Healthy merino ewes with good teeth and carrying not more than four or five months' wool should fatten on good feed in three or four weeks.

"PEA STRUCK" SHEEP.

When the Darling pea is in pod, its effects on animals are most noticeable. There is no medicinal treatment, but sheep noticed as affected should be removed immediately to a paddock in which the plant is not growing. Recovery is then certain and rapid, unless, of course, the animals are too far gone.

If practicable, the plants should be hoed out and destroyed. If very thick a flame thrower may be profitable to use.

One thing is certain, however, once sheep have acquired a taste for Darling pea they will always look for it—hence the necessity of grazing these particular sheep on country where the plant does not exist.



Effect of Disease on Composition and Yield of Milk.

The effect of disease on milk from cows is variable. Usually there is an alteration in composition, accompanied by a decrease in yield. Generally speaking, the milk-sugar (lactose) is considerably decreased and the chloride and ash content increased. Fat is more likely to be increased than diminished. Casein is likely to be lowered and albumen increased, whilst the total protein may remain constant. A consideration of one or two important diseases will illustrate the changes that may occur.

Mastitis is one of the commonest diseases in this country, and analyses show that the casein, fat, and lactose are markedly reduced and the cholrides increased in milk from cows suffering from this malady. Casein and fat are the all-important substances in the manufacture of cheese, and a deficiency in these constituents in milk means a lowered chese yield at the factory. The importance of this disease in relation to cheese-making is, therefore, very evident, and only serves to emphasise the need for greater care and vigilance on the part of all concerned in the dairying industry.

Foot and mouth disease is not known in Australia, but analyses of milk in countries where it occurs show that drastic changes are wrought in the composition and yield of milk. One of the most noticeable effects of the onset of this disease is a very marked reduction in the volume of the milk secreted—often to one-quarter of its original quantity. The changes in composition depend very much on whether the udder is inflamed or not. If the udder is inflamed, then the changes in composition are very similar to those that occur in cases of mastitis. When the udder is not inflamed the fat, protein, and ash are increased and the lactose diminished. The fat may rise to as high as 10 to 15 per cent., the protein to 5 per cent. (normally 3), and the lactose diminish to 3 or 4 per cent. (normally 5).

It is rather curious and interesting to find that the composition of milk when a cow dries off is very similar to that from a cow with foot

and mouth disease, without inflammation of the udder. Drying a cow off usually involves a considerable reduction in her feed, together with less frequent milking, and it is suggested that there is a similarity between these conditions and those that occur in severe disease. In cases of disease there is a marked decrease in the food intake, and the milkings are apt to become less frequent. The abnormality of milk and the decrease in yield brought about by these two diseases alone indicate the economic importance of disease in regard to the dairying industry. Anything that the individual farmer may do towards improving the health of his herd will not only be of benefit to himself, but to the industry at large.

PALATABILITY OF STOCK FOODS.

While the cost of the ration fed to dairy cows is likely to influence its composition, consideration should also be given to the palatability of the feeds selected. Nothing should be fed to the animals which will affect the quality of the product yielded. What is suitable for one animal may not be suitable for another, and the method of using stock foods governs their value. For producing animals—i.e., animals converting the food eaten into some product such as milk—it is essential that they should eat enough. In order to guarantee this sufficiency, care should be taken to ensure that the ration fed is wholesome and palatable.

Unless the ration is palatable, cows and fattening pigs will not consume sufficient food for the efficient production of milk and cream, and bacon. Unpalatable foods which have to be fed to milking cows should be used sparingly and mixed with some other well-liked feed. In this way the bulk of the ration can be increased, the more palatable ingredients inducing the animal to consume the whole of the mixture. Roughage can be chopped and mixed with concentrates. The roughage often becomes softer and the mixture more wholesome and appetising by mixing it with a dilution of molasses.

It is only by feeding rations of a palatable nature that the maximum production can be obtained from live stock. At the same time, it must be remembered that an important function of farm animals is to convert into useful products material which would otherwise be wasted. By keeping a watch on the materials at hand, it should be possible to dispose of practically all the feed available in a way which will ensure the best return.

CARE OF CREAM IN TRANSIT.

A contributing factor in the low grading of some cream at the butter factory is often lack of thought and care for it while in transit. Some farmers blame cream carriers or railway officials for any deterioration which occurs while it is on the road; but, presumably, if the carriers and the railwaymen do neglect to give the extra care which cream needs, particularly in hot weather, they may be merely following the example of indifference displayed by the owner of the cream.

For example, cream may be brought in by a farmer and left at the station overnight to be consigned by a train timed to leave, say, at 7.20 next morning. Mostly such cream comes from farms only 2 or 3 miles distant. Surely, any dairyman who takes a pride in turning out choice cream can arrange such a short journey in the three hours of daylight before train time. The owner should realise the deterioration which must develop in cream in cans which may be left to stand at the station for twelve hours lidded down and unstirred through a warm night; but let the train be an hour late and hear the complaints about the neglect of the Railway Department!

A less frequent fault in delivering cream too early at the railway siding or roadside is the neglect to make allowance for the alteration of the sun's position as the day advances. A shady spot selected at 10 o'clock in the morning may be no longer shady at noon, and by the time the cream can is lifted by the railway man or the cream carrier it may have been exposed to the direct heat of the sun for an hour or longer.

In many parts of Queensland extra attention to details is demanded by the exigencies of the climate and, in this, the efforts and care of each individual handling cream in transit becomes all important.

CLEAN MILK IN HOT WEATHER.

At this season of the year, the problem of keeping milk from souring requires a little extra attention. Bacteria thrive at midsummer temperatures and cause milk to sour and lower the butter-making qualities of the cream. Chief among the measures of defence against the souring of milk are cleanliness and cooling—i.e., low temperature. It is not enough to draw the milk in a clean way; utensils must be clean to the point of being practically free from souring bacteria. In addition, milk must be cooled immediately, if its quality is to be preserved long enough to permit its delivery to the consumer in an acceptable condition.

Milk sours very quickly at high temperatures. This, however, is not the only cause of the souring of a lot of summer milk. Mudholes, manure heaps, swamps, and the muddy banks of streams in the grazing paddocks help to deposit a considerable number of bacteria on the teats, udders, and adjacent parts of the cows. The bacteria which gain entrance to the milk at the time it is drawn and in course of conveyance to the cans for temporary storage, or for immediate delivery, have a lot to do with the time required for souring.

If the customer should complain of sour milk in the warm weather, and should the cooling of the milk fail to remedy this defect, then all possible sources of contamination should be investigated. In some cases, this will be found coming from the filth of muddy places, or the dust, or dry manure.

With sterile utensils and rapid cooling, a low bacterial count may reasonably be expected; likewise the complete elimination of rejected supplies, higher quality milk, and, consequently, greater profits.

POINTS IN DAIRY PRACTICE.

Maximum results on the dairy farm can only be obtained by the successful combination of three factors—the farmer, the pasture, and the stock. The farmer must efficiently manage and improve his pastures, while the stock must give the highest possible amount of milk fat from the quantity of food consumed.

The farmer may claim that he has good cows and produce factory returns as evidence thereof. That evidence, however, is merely proof that the herd is good, not that each individual member is good. Until he submits his herd to regular testing, he has no definite proof that his herd contains no unprofitable cows, that his herd sire is at least maintaining the production in the younger stock, or that he is breeding from the right cows. A record of any drop in factory returns is an open book to the regular testing farmer, but a sealed book to the farmer working solely on factory returns.

If the position is to be improved by herd testing, the responsibility is on the farmer to consider the individual results and carry out the necessary remedies. Failure to act on the part of the farmer cannot be held against herd testing.

The fertility of the land must be maintained if the pastures are to carry the stock economically. Each cow returns to the soil a proportion of the plant food it consumes in the form of manure, which should be regularly broken up and distributed by harrows. The plant foods which are not returned to the pastures are those which make the milk and those used to produce and maintain the body of the animals. A cow which produces 500 gallons of milk in a lactation period, equivalent to approximately 200 lb. of fat, removes from the pasture at least 7 lb. of lime and 11 lb. of phosphoric acid in the milk alone. This is equivalent to approximately a ½ cwt. of bonedust or superphosphate. Thus a herd of forty such cows would remove yearly the equivalent of 1 ton of those fertilizers from the pasture. As a large proportion of Queensland soils are deficient in phosphorus, particularly in coastal areas, a loss such as this is a very serious matter, and if not returned to the soil in some form, pastures will deteriorate, and conditions conducive to the occurrence of stock diseases peculiar to phosphorus deficiency may develop.

There are various ways in which these plant foods can be returned to the pastures. The obvious method is to distribute the phosphatic fertilizer over the pastures; a less obvious but efficient method is to administer at least 2 oz. of bone meal to each cow daily. This weight only makes good the calcium and phosphorus removed in the milk and is distributed over the pastures in the droppings.

The introduction of improved pasture grasses and the adoption of rotational grazing would also assist materially in obtaining the maximum efficiency on the dairy farm.

NAVEL INFECTION.

In newly-born animals the navel is a prolific source of infection. Under farm conditions, it pays to treat the umbilical cord as soon as possible after birth. First, tie it with a string in a 5 per cent. carbolic solution, then paint the cord and surrounding area with a 5 per cent. iodine solution or dettol.

PASTURES AND BUTTER-FAT.

Efficient production is the only form of economic production, and this, perhaps, applies more to dairying than to any other primary industry.

Efficiency is achieved by ensuring that cows receive the right food in the right quantities. The cheapest means of filling the first requirement is by herd testing and culling, since by this method only high-producing cows are maintained on the farm.

Nowadays, the value of dairy land is judged, not by the number of cows it will carry, but by the butter-fat production per acre. Once this idea is fixed in mind, it becomes obvious that the higher the cow yields the more economic a producing unit she becomes. Low producers means reduced output and reduced efficiency in the working of the farm.

As the dairy cow is required to produce large quantities of milk which is rich in protein, it follows that it must be given foods which are likewise rich in protein. There is little difference between the food values of the various popular cultivated grasses, which in the early stages of growth are equal in protein content to many valued concentrates. The young shoots are very rich in this respect, and this accounts for rapid recovery of cattle grazing on pastures after rain following spells of dry weather, or after a burn.

Here, then, is a natural food for the dairy cow readily available. It is economic, too, because with a little care it can be produced in large quantities, and it requires no labour in feeding. The dairy pastures then deserve special attention to maintain them at an efficient standard. There are several ways of maintaining and improving pastures, namely:—

(1) The growing of grasses which have a high-feeding value.

(2) Top dressing pasture land.

(3) Rotational grazing, or, in other words, feeding the grass while in its young stage of growth.

(4) Renovation of pastures.

In selecting grasses, attention must be given to their adaptability to local conditions, period of growth and production, nutritive value, palatability, and suitability for grazing and hay making. The length of the grazing season is increased and the returns improved by the use of top dressing. Its practicability depends on the increased returns in terms of cash.

Rotational grazing does not involve so great an outlay and is more a matter of pasture improvement by ensuring the economical use of herbage. The subdivision of holdings to provide rotational grazing appears to offer a ready means of immediate benefit through pasture management. And now is the time to act. It will be too late to achieve any advantage if it is left to make a start when the season turns dry.

Body Length in Pigs.

Now that carcase appraisal has provided a definite measure of carcase quality in pigs, there is indisputable evidence of a general lack of body length in Australian pigs.

For a long time leaders in the pig industry have stressed the necessity to select for body length, and breeders have attempted to secure this desirable features in their pigs; in fact, most breeders thought their pigs had sufficient body length. However, since pigs have been measured under the carcase appraisal system during the past few years, it has been found that Australian pigs generally are too short.

Body length is not only an important characteristic from the bacon curer's point of view, but the producer also wants long pigs because they are usually more productive—long-bodied sows are usually better milkers, and that extra inch in the middle helps the weight when pigs are being sold.

Investigators have shown that pigs with bodies long in proportion to their weight also have the desirable light covering of back fat.

Body length in proportion to weight can be increased by growing the pigs slowly, but this practice is usually uneconomical, and as body length is an hereditary characteristic and is associated with the number of ribs in the pig, it is important that breeding stock should be selected for length of body, either judged by appearance or by records of pigs of similar breeding whose carcases have been appraised.

The number of ribs in pigs varies from thirteen pairs to seventeen pairs, while most pigs have fourteen pairs or fifteen pairs. Such knowledge enables the breeder to have a wide field for selection of stock.

There has been a tendency to select stock with good hams and good heads. These are valuable features in the pig, but not nearly so important

as body length, and in obtaining goods heads and hams body length is usually lost. Breeders and judges of pigs might, therefore, with advantage place a lot more importance on selection for body length, even if something is lost in ham and head quality.

The best pig for the grower or the trade is a pig well balanced in all features, but if body length has been lost, it should be retrieved quickly. It is difficult to place too much importance on body length of pigs, particularly when it is remembered that a light covering of back fat and light shoulders are usually associated with good body length.

Pig-raisers may obtain an appraisal of their pigs through various carcase competitions, or by arrangement with the firms slaughtering their pigs. Full information on these services can be obtained from the Department of Agriculture and Stock.

Pig breeders who fear that the pig which suits the meat trade will not suit the farmer may find solace in the knowledge that in Denmark, where pig improvement has been based on the results of careful testing for many years, there has been marked increase in body length, decrease in back fat, increase in streak thickness, decrease in food consumption per lb. of pork, and increase in rate of growth. These statements are based on the analysis of complete records on many thousands of Danish pigs of the Large White and Landrace breeds, and therefore indicate that similar improvement might be anticipated with other breeds of pigs, provided similar methods are adopted.

Pig-recording is costly work, and involves the use of testing stations, but some useful work can be done at very little cost by growers recording the prolificacy of their sows, the rate of growth of their pigs, and the carcase quality of their porkers and baconers.

PIGGERY PESTS.

At this season of the year pigs are frequently tormented by house flies, mosquitoes, and lice. This irritation can be allayed to a large extent by giving the pigs a daily dressing (only a very small quantity at each application) of oil to which a small quantity of disinfectant has been added.

The pig has a tough skin and often carries a coarse coat of hair, but despite that his health may suffer through parasitic infestation. Where the skin is lacerated or badly sunburnt and cracked, blowflies and house flies swarm around, becoming a source of risk to the animal's general health. Wounds resultant from castration and other operations are favourable places for attack by blowflies. Where there is considerable inflammation, painting the affected areas with a dilute solution of iodine will be helpful. Carbolised glycerine—or boro-glycerine—is an excellent dressing once the wounds have been thoroughly cleansed by washing and/or syringing out. Any treatment for reduction of irritation and inflammation and assistance in healing will be beneficial.

Prevention of attack is often difficult, but something might be attempted along these lines by eradicating breeding grounds like manure heaps where flies breed freely. Swampy areas encourage mosquitoes and sandflies, and neglected sties and pens and rubbish lying about harbour fleas and lice. A general clean-up along the lines of a spring cleaning is worth while.

WHEN SELLING PIGS.

Porkers should be marketed at an age and weight to suit export market conditions, as well as the local trade. Best trade weights, for prime conditioned pigs, range between 60 lb. and 90 lb. dressed (approximately 95 lb. to 139 lb. live weight). For local markets, the best range is 60 lb. to 80 lb. dressed weight (95 lb. to 130 lb. live weight). Porkers should be in good condition, free from bruises, whip marks, or other faults, and be protected from the effects of severe heat; otherwise, they will not dress out to advantage on slaughter. Lighter weights and very thin pigs are not profitable as porkers, and at factories and meatworks will only be paid for at valuation.

Bacon pigs for local markets should be 90 lb. to 130 lb. dressed weight (approximately 140 lb. to 185 lb. live weight), with added range to 160 lb. dressed weight (220 lb. live weight) at slightly lower rate per lb. dressed. For export, the range of weights varies from 120 lb. dressed weight (175 lb. live weight) to 160 lb. dressed weight (220 lb. live weight), but the heavier pigs should not carry too much fat; otherwise, they are subject to reduction in price or to rejection. For local markets also, there is a strict limitation to the percentage of fat, and factories prefer pigs in meaty condition with only a slight covering of fat.

Sows for small goods trade should be in good condition, and should have weaned their litters two months or more before marketing; also, they should not be in pig any more than one month, if in pig at all. Sows close to farrowing and those farrowed recently are liable to condemnation at the factories. Poor brood sows and poor stags are useless and will not be accepted, while boar pigs are useless for meat purposes until castrated, and then well fed for approximately two months, the time depending on the progress made after the operation.

In every instance the greatest care should be taken to avoid bruising and damaging the pigs in transit, especially when loading and unloading. Pigs carted to country sidings for trucking or sale should not be fed immediately before despatch, as such feeding is conducive to heavier shrinkage and to digestive disorders in transit.

It is again emphasised that under the Queensland Pig Industry Act all pigs must be branded by the vendor before sale, barter, or exchange. Full information on any of these points is obtainable from the Department of Agriculture and Stock, Brisbane.

THE BREEDING SOW.

Experience has shown that sows having the benefit of succulent and nutritious pasture and plenty of daily exercise in the sunshine in clean paddocks, where they are undisturbed by other stock, are more likely to have big litters than sows which are continuously housed or confined to a small pen.

Keeping pigs in paddocks is satisfactory only where clean, warm, dry shelter sheds are available, in which the pigs may camp at night.

As the farrowing stage approaches, it is advisable to place each sow in her own individual yard or pen. The best time to do this is about three weeks before the sow farrows.

Sows housed together at farrowing time are likely to become quarrelsome, and any disturbance, particularly at feeding time, may result in abnormal births, if not in abortion.

Under open-air conditions and with succulent grazing, there should be little or no necessity for purgative medicines before farrowing. However, as individual animals differ in habits, and some are lethargic at this stage, a warm bran mash in which is mixed three fluid ounces of castor oil and just enough table salt to disguise the flavour of the oil will be beneficial, if given two or three days before the farrowing date.

Use of drastic purgatives should be strictly avoided, as the after effects are liable to bring on irregularities in the digestive organs. Careful control will do more than medicine or force in assuring satisfactory results. The food should be of a laxative, nourishing nature, and quantity should be strictly regulated according to the condition of the sow and litter.

MONEY IN PIGS.

That there is good money in pigs if they are properly bred, fed, and controlled is again evidenced in the bacon factory returns of a farmer on the Evelyn Tableland, North Queensland. Sales over twelve months totalled 107 bacon pigs, all of which were bred on the farm, plus 45 store pigs, which were sold because of continued dry weather.

The bacon pigs were sent to the North Queensland Co-operative Bacon Association factory at Mareeba, which has a regulation requiring farmers to notify the number of all pigs being consigned at least three days before trucking. The farmer's practice is to weigh his pigs on Thursday to decide the number to be sent on the following Monday, so that the factory may be advised. The weight put on by the pigs in the meantime is invariably reflected in factory weights.

The sales table for the period indicates that this farmer has found that there is money in pigs.

Date.	Sales.	Realisations.
1938—	Pigs.	£ s. d.
July 9th	6	16 11 9
July 31st	16	43 14 0
August 20th	9	26 1 9
September 10th	9	24 12 2
September 24th	15	41 13 1
September 30th	7	17 12 3
October 22nd	5	13 0 8
November 26th	4	6 14 6
December 17th	10	21 11 1
1939—		
January 21st	19	37 13 2
February 25th	2	3 19 5
June 17th	4	8 3 8
June 30th	1	2 4 2
	107	
Deferred pay at ½d. a lb.		18 2 0
		£283 13 6
45 pigs sold as stores at £1 5s. each		56 5 0
Total sales		£339 18 6

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Adler, Tinana	Nevertire	White Leghorns, Australorps, Rhode Island Reds, and Langshans
F. J. Akers, Eight Mile Plains	Elmsdale	White Leghorns and Australorps
E. J. Blake, Rosewood	Sunnyville	White Leghorns, Australorps, White Wyandottes and Rhode Island Reds
R. H. & W. J. Bowles, North Rockhampton	Glenmore Poultry Farm and Hatchery	White Leghorns and Australorps
J. Cameron, Oxley Central	Cameron's	Australorps and White Leghorns
M. H. Campbell, Albany Creek, Aspley	Mahaca Poultry Farm and Hatchery	White Leghorns and Australorps
J. L. Carrick & Son, Manly road, Tingalpa	Craigard	White Leghorns
N. Cooper, Zillmere road, Zillmere	Graceville	White Leghorns
R. B. Corbett, Woombye	Labrena	White Leghorns and Australorps
T. G. Crawford, Stratford	Rho-Isled	Rhode Island Reds
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme	White Leghorns, Australorps, and Rhode Island Reds
Dixon Bros., Wondecla	Dixon Bros.	White Leghorns
Rev. E. Eckert, Head street, Laidley	Laidley	Australorps, White Leghorns, and Langshans
Elks & Sudlow, Beerwah	Woodlands	Australorps and White Leghorns
W. H. Gibson, Manly road, Tingalpa	Gibson's	White Leghorns and Australorps
Gisler Bros., Wynnum	Gisler Bros.	White Leghorns
G. Grice, Loch Lomond	Kiama	White Leghorns
J. W. Grice, Loch Lomond	Quarrington	White Leghorns
Mrs. M. Grillmeier, Mount View, Milman	Mountain View	Australorps, Minorcas, and Rhode Island Reds
C. & C. E. Gustafson, Tannymorel	Bellevue	Australorps, White Leghorns, and Rhode Island Reds
P. Haseman, Stanley terrace, Taringa	Black and White	Australorps and White Leghorns
C. Hodges, Kuraby	Kuraby	Anconas and White Leghorns
J McCulloch, Whites road, Manly	Hindes Stud Poultry Farm	White Leghorns, Australorps. and Brown Leghorns

Name and Address.	Name of Hatchery.	Breeds Kept.
A. Malvine, junr., The Gap, Ashgrove	Alva ..	White Leghorns and Australorps
H. L. Marshall, Kenmore ..	Stonehenge ..	White Leghorns and Australorps
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White Leghorns, and Langshans
J. A. Miller, Racecourse road, Charters Towers	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	Australorps, Brown Leghorns, and White Leghorns
Mrs. H. I. Mottram, Ibis avenue, Deagon	Kenwood Electric Hatcheries	White Leghorns
J. W. Moule, Kureen	Kureen ..	White Leghorns and Australorps
D. J. Murphy, Marmor ..	Ferndale ..	White Leghorns, Brown Leghorns, Australorps, Silver Campines, and Light Sussex
S. V. Norup, Beaudesert Road, Cooper's Plains	Norup's ..	White Leghorns and Australorps
H. W. & C. E. E. Olsen, Marmor	Squaredeal Poultry Farm	White Leghorns, Australorps, Black Leghorns, Brown Leghorns, and Anconas
A. C. Pearce, Marlborough ..	Marlborough Stud Poultry Farm	Australorps, Rhode Island Reds, Light Sussex, White Wyandottes, Langshans, Khaki Campbell and Indian Runner Ducks, and Bronze Turkeys
E. K. Pennefather, Oxley Central	..	Australorps and White Leghorns
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farm	White Leghorns, Australorps, Langshans, Rhode Island Reds, and Brown Leghorns
G. R. Rawson, Mains Road, Sunnybank	Rawson's ..	Australorps
J. Richards, Atherton	Mount View Poultry Farm	White Leghorns and Australorps
H. K. Roach, Wyandra	Lum Burra ..	White Leghorns and Australorps
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
A. Smith, Beerwah	Endcliffe ..	White Leghorns and Australorps
A. T. Smith, The Gap, Ashgrove	Smith's ..	White Leghorns and Australorps
T. Smith, Isis Junction	Fairview ..	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
A. J. Teitzel, West street, Aitkenville, Townsville	Teitzel's ..	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's Poultry Farm	White Leghorns and Australorps
W. A. Watson, Box 365, P.O., Cairns	Hillview ..	White Leghorns
G. A. C. Weaver, Herberton road, Atherton	Weaver's Stud Poultry Farm	Wyandottes, Indian Game, Barred Rocks, Australorps, White Leghorns, Anconas, Rhode Island Reds, Buff Orpingtons, Black Orpingtons, and Buff Leghorns.
T. Westerman, Handford road, Zillmere	Zillmere ..	Australorps and White Leghorns
H. M. Witty, Kuraby	..	White Leghorns and Australorps
P. A. Wright, Laidley ..	Chillowdeane ..	Brown Leghorns, White Leghorns and Australorps
R. H. Young, Box 18, P.O., Babinda	Reg. Young's ..	White Leghorns, Brown Leghorns and Australorps

POINTS IN POULTRY KEEPING.

The maintenance of the flocks in a condition of good health largely depends on two factors:—(1) stock of sound constitutional vigour, and (2) sanitary surroundings.

Only healthy laying and breeding stock possessing an abundance of constitutional vigour should be kept. The removal of birds from the flock at the first sign of debility or sickness is a necessary precaution against loss.

Since the welfare of the healthy members of the flock is of far greater importance than that of a few sick birds, it is important to look after the healthy birds first. Sick birds should be culled out of the flock. The poultry house can then be cleaned and disinfected. All feeding and drinking utensils should be thoroughly washed.

If treatment of sick birds is advisable they should be kept confined while under treatment. Birds suffering from a contagious disease should be quarantined until all danger of contaminating the rest of the flock is over. In many cases of disease it is better to kill the affected birds at once, and burn or bury them deeply. In no case should diseased birds be sold.

Sanitation is a very important factor in keeping down disease in poultry flocks. The land used for poultry should be kept free from contamination by regular cultivation and the growing of grass, or some other kind of crop. Some poultrymen lime their soil annually. It is, of course, necessary to keep poultry houses clean and well littered with clean, dry straw. Houses to be kept free from dampness need good ventilation, draughts should be avoided. Overcrowding tends to weaken the vitality of the stock, and careful poultrymen allow three or four square feet of floor space to each bird. Poultry houses should be disinfected thoroughly at frequent intervals. If disinfectants are used, the fowls should not be marketed until the odour of the disinfectant has completely gone. If poultry are to be marketed shortly after disinfecting the premises, the house may be best disinfected with a 4 per cent. solution of formaldehyde. Disinfection will be most effective if the floors, walls, and roosts are first cleaned thoroughly.

The culling of laying flocks has been practised for a number of years in practically all parts of the country, and, as a result, the laying qualities of the flocks have greatly improved. Culling has also led to a better distribution of the marketing of surplus hens. While the practice of culling the laying stock is designed to eliminate the poor layers, sometimes there is a tendency to market hens in unthrifty condition or in poor health, a practice which cannot be too emphatically condemned. Only the slip-shod farmer will market hens in poor flesh, and it obviously pays to select stock carefully before marketing.

MILK AS A FOOD FOR FOWLS.

Skim milk is an excellent poultry food, and if fowls are given all the skim milk they can drink, and even if fed on nothing else but grain, they will continue to lay well.

Farmers generally appreciate the necessity of efficient feeding and, to give their fowls the necessary amount of protein, use one or other of the prepared mashes. These mashes are usually fed with grain, the

birds being given an equal quantity of each. In these circumstances a sufficient amount of protein is made available to the birds.

The farmer who has skim milk to give his birds may therefore depart somewhat from his ordinary practice, for skim milk is a protein-rich food; but how far he may do so depends on the quantity of skim milk available. If the birds are given only, say, half the skim milk they will consume, half the quantity of mash that is usually fed should be supplied and the grain increased by about 50 per cent.

It will generally be found a sound policy when milk mash and grain are being fed to the flock to give the birds all the grain that they will consume, and not force them to eat given quantities of mash. This practice will largely enable the birds to balance their own ration.

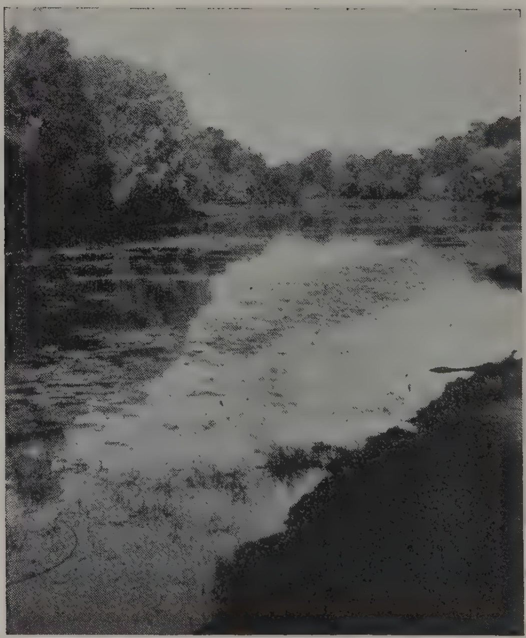
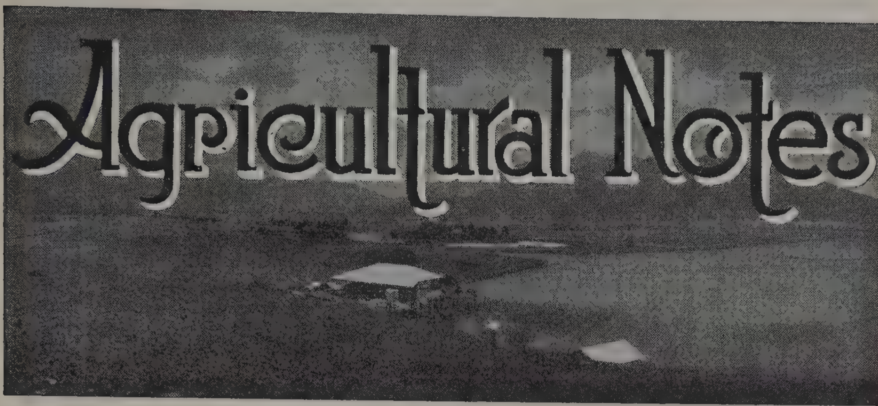


Plate 295.

ON THE SMITHBURNE RIVER, NORTH OF NORMANTON, IN THE GULF COUNTRY, NORTH QUEENSLAND.



Pasture Renovation in the Central District—Cotton a Factor.

In the Central district, on both scrub and forest land of the various coastal areas, the older stands of Rhodes grass are gradually dying out. Paddocks which at one time would safely carry a beast to three acres have been reduced to less than half that carrying capacity. On some farms the Rhodes grass has almost disappeared, and its place has been taken by numerous varieties of weeds and herbage. The loss of grass has not only markedly reduced the production of cream by the dairy herd, but the grazing of the cows on the resultant weed growth has frequently caused serious tainting of the milk produced. Instances of farmers receiving as high a return as 80 per cent. of weed-tainted cream during a twelve months' supply are not uncommon, and show the extent to which the pastures have deteriorated. The farmer is thus a heavy loser because of both decreased production and the lower price paid for weed-tainted cream.

The two problems mentioned above go hand in hand, and will have to be faced by a greater number of farmers as the Rhodes grass pastures grow older.

The major cause of the depletion of these pastures is injudicious stocking and a lowered supply of nitrate nitrogen in the soil. The heavy yields produced by this excellent grass drain the soil of the plant food nitrate nitrogen to a great depth until eventually there is not enough nitrate to promote sufficient grass to suppress weed growth. It is necessary, therefore, to grow Rhodes grass in a crop rotation which will allow of the restoration of ample supplies of nitrate nitrogen before the grass is resown.

It has been found in investigations conducted at the Biloela Research Station that the ploughing of the old grassland for three years' growth of cotton and then replanting Rhodes grass is a very suitable way of bringing the depleted grass paddocks back to normal production. Yields of 3½ tons of air-dried Rhodes grass hay have been produced at this station in the second year of establishment of the grass on forest alluvial soils following cotton. There is not only a restoration in yield of the grass obtained through the use of this rotation, but the quality of the grass also is very much improved for a considerable period.

The use of this rotation also definitely improves the yields of cotton, as compared with cotton crops grown on old cultivations. Gains ranging from 20 to 60 and even 100 per cent. have been obtained, both in experiments and commercial crops. Cotton-growing should, therefore, have a very definite place in the renovation of wornout pasture lands—whether Rhodes gross or native grasses have been the dominant growth—especially as there is an increasing demand for cotton in Australia.

Further information on the grassland-cotton rotation and the growing of cotton may be had on application to the Department of Agriculture and Stock, Rockhampton.

A SIMPLE METHOD OF WATER-PROOFING FARM SHEETS.

A simple and cheap method of water-proofing closely woven fabrics —such as old tarpaulins or calico sheets,—is to rub into them a solution of approximately 2 lb. of paraffin wax to 1 gallon petrol.

To save time in preparing the solution, the wax may be flaked with a knife and gently heated until it melts. It may then be poured into the petrol and stirred well.

If the sheet to be dressed is hung over a rail the solution may be applied with a cloth pad. When the petrol evaporates a thin film of wax is left on and between the threads of the fabric. This prevents mildewing and forms a permanent water-proof coating.

"CARROT FERN"—A POISONOUS PLANT.

Specimens have been received by the Department of a plant cultivated in gardens under the name of "carrot fern." The specimens were sent with a report that a child had died from accidentally eating some part of the plant. The plant proved to be hemlock (*Conium maculatum*), common in Europe, and in early times was used for poisoning criminals condemned to death. The poisonous principle is due to an alkaloid, coniin, which tends to disappear as the plant is dried. The plant is moderately common in cultivations, and is grown primarily because of its ornamental fern-like foliage. It grows several feet in height, and has small white flowers.

In Europe, accidental cases of poisoning are on record where the seeds have been mistaken for aniseed, the leaves for parsley, and the roots for parsnips.

A general warning about the plant is given, and this is the first case in Queensland so far as we know of anybody having been poisoned by the plant. The plant apparently is not often touched by stock, although cases of poisoning by it in Europe are on record.

PROPAGATION OF GRASSES.

Frequently enquiries are received by the Department of Agriculture and Stock as to where seed of blue couch, Kikuyu, Panicum muticum (Para), and Guinea grass can be obtained. Kikuyu grass fails to set seed in Queensland, and little or no seed of commercial value is collected from stands of the other grasses.

Propagation is usually carried out with roots, runners, or plants, except in the case of Guinea grass, which is reproduced from roots or plants only, as it does not send out runners. Supplies of the roots may best be obtained direct from the grower.

It is sometimes the practice to pass the runners of Kikuyu grass or Para grass through a chaffcutter set wide so that the resultant "chaff" can be broadcasted and harrowed in.

Blue couch should not be confused with the ordinary couch of Queensland, which can be grown from seed.

USE OF SODIUM SILICATE.

Sodium silicate, under the name of waterglass, is well known on farms as an egg preserver. In its different forms it has a variety of uses.

A hot 1 per cent. solution (1 lb. to 10 gallons) of alkaline sodium silicate is a powerful detergent, and is consequently used widely in cleansing floors, utensils, cream cans, and bottles. It is also used to remove grease and dirt from clothes.

Colloidal sodium silicate is used in proofing casks and rendering concrete floors, feeding troughs, and holding tanks, resistant to the acids that arise from bacterial action on fats, molasses, and other fermentable substances.

Timber and fabrics may be impregnated with sodium silicate to make them fire proof. The solution can be used as a vehicle for pigments and fillers, so that two jobs may be done at once.

THE PREVENTION OF SORGHUM POISONING.

In view of the numerous enquiries from farmers regarding the poisonous properties of various members of the sorghum family when immature, attention is called to the characteristics of the chief types in general cultivation.

All plants of the sorghum family, which includes Soudan grass, Johnson grass, the sweet or saccharine sorghums, such as saccaline, and the grain sorghums represented by feterita, contain quantities of a prussic-acid-yielding glucoside, which often causes fatalities among stock where reasonable precautions are not taken.

The poison is chiefly concentrated in the young stalks, but decreases in amount as the plants grow, the danger, normally, becoming progressively less.

Stock should, therefore, never be allowed access to immature feed (sweet) sorghum, especially if wilted through dry weather. Second growth and immature frosted material is also dangerous. The sweet sorghums are most palatable and nutritious when the grain is in the milky stage, and this is obviously the most opportune time to cut for silage or fodder purposes. Once the heads are well out, stock can, normally, be grazed or fed with safety.

Sudan grass is largely grown as a grazing crop, and many Downs farmers have successfully fed this grass to stock during all stages of growth over a series of years. It is much less toxic than other cultivated members of the sorghum family at corresponding periods of growth, but farmers should exercise caution, particularly during hot dry weather, and should never at any stage in the plants' growth turn in hungry stock to graze. It is also important to obtain pure seed, as all sorghums hybridise readily, and fatalities have been reported, as a result, possibly, of using hybrid seed.

Immature Johnson grass is distinctly more poisonous than any of the cultivated members of the sorghum family. This grass should, therefore, be eradicated wherever possible, as it spreads rapidly from roots and seed. The seed is difficult to distinguish apart from Sudan grass seed, but the plant can always be identified by its deep-rooting habit, whereas Sudan grass has shallow fibrous roots.

Farmers should not allow the poisonous properties of sweet sorghum or Sudan grass to deter them in the cultivation of these valuable crops for both fodder and silage purposes, as, with the adoption of reasonable precautions, fatalities need not occur.

In the coastal areas where only mild frosts are experienced, varieties such as "Saccaline" can be sown as late as February.

THE pH SCALE.

The term pH is now so commonly heard or read that it is to the farmer's advantage to understand, not merely that a pH value indicates in some way the acid, neutral or alkaline condition of his soil, but to have also some knowledge of the meaning of the value and the theory on which it is based. The following explanation, it is hoped, will assist in this direction:—

Acids contain hydrogen combined in their molecules. In solution (as in the soil) the molecules or acids, alkalis, and salts break up (or dissociate) to a certain degree to form ions. The ion common to all acids and on which acid properties depend is the hydrogen ion. Now, different acids containing *similar amounts of hydrogen in combination* dissociate to different extents to give *different amounts of hydrogen ions in solution.*

Take two acids, for instance—acetic acid and hydrochloric acid. The amounts of acid present may be the same, and may be neutralised by the same amount of alkali, such as caustic soda, and yet the actual degree of acidity or intensity of acidity would be far greater in the case of the hydrochloric acid, because, at the same concentration, it is dissociated into ions to a far greater extent, and make "available" far more hydrogen than the acetic acid.

These hydrogen ions may be considered as "free" or "active" hydrogen, and are termed potential hydrogen—from which the term pH is derived.

The figures used to denote pH are based on the volumes of different solutions that would contain a set weight of hydrogen ions. The scale ranges from 0 to 14, and, as the greater the volume required, the lower the concentration of hydrogen ions; acid solutions are indicated by low figures and alkaline solutions by the high figures.

pH 7 is neutral—the pH of distilled water. On account of the system used in obtaining the pH, a decrease in 1 unit on the scale indicates an increase of ten times, and a decrease of 2 units indicates an increase of 100 times the acidity. Conversely, rises in pH indicate decreases in acidity to the same extent.

From the foregoing, it will be appreciated that the pH (potential hydrogen) of a soil is an indication of the concentration of hydrogen present in ion form in the soil solution. It should not be confused with the amount of acids present in the soil—as indicated by titration against an alkali—as only portion of these acids are dissociated into ions and, consequently, they may be said to have much of their power not available.

The following guide to the interpretation of values is given:—

pH 4·0 to 4·7—Very strong acidity.
pH 4·7 to 5·2—Strong acidity.
pH 5·2 to 5·8—Medium acidity.
pH 5·8 to 6·4—Moderate acidity.
pH 6·4 to 7·0—Slight acidity.
pH 7·0 —Neutral (pure water).
pH 7·0 to 7·5—Slight alkalinity.
pH 7·5 to 8·2—Medium alkalinity.
pH 8·2 to 8·5—Strong alkalinity.

Beyond these limits, cultivation is not normally possible.

From the foregoing is will be seen that only a small portion of the pH scale is used in actual practice.

A RUBBER "SLAPPER."

For driving livestock (especially pigs), I use a rubber slapper made as shown in illustration. I take a piece of old tyre inner tube about 3 feet long and cut several

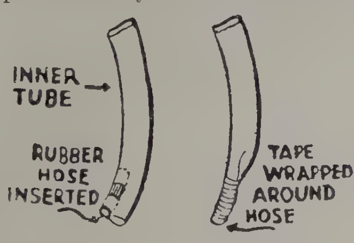


Plate 296.

slits in one side, through which I insert the rubber hose handle. When the hose is worked through the slits I wrap the tube tightly around it and bind with tape to make a firm and very satisfactory hand grip.—S.S.H. in *The New Zealand Farmer.*

Preparation of Land for Deciduous Fruit Trees.

If a man about to plant an orchard were asked for how long he expected it to be a profitable investment, he would probably reply, "For the rest of my life." This being so—and an orchard can and should last a lifetime—it is obvious that too much care cannot be bestowed on the preparation of the land for the reception of the trees; but it is surprising to find that in some cases the land actually receives less preparation than it would for a quickly-planted row of cabbages.

Trees badly planted in ill-prepared ground cannot thrive, and to attempt to establish an orchard under such conditions is really a waste of time and money. There have been cases in which growers have planted the trees, and then tried to finish "the preparation" of the land afterwards. This cannot be done satisfactorily, and the grower would have been better off in the long run had he deferred his planting for a year.

There is nothing so unsatisfactory as working an unthrifty orchard. On the other hand, nothing in the working life of the orchardist gives more pleasure and satisfaction, or is so interesting, as caring for and harvesting the profit of trees that do well, and respond to good treatment.

In the preparation of the land subsoiling is desirable, although not absolutely necessary, provided the land can be, and is, ploughed to a sufficient depth. Should there, however, be a hard pan under the surface soil then subsoiling is necessary; for, if it is not done, the trees may suffer severely from "wet feet."

A disc plough is, generally, the most satisfactory implement to use; and, if it is not set to cut too wide a furrow, it can be made to plough 18 inches deep.

When preparing land for fruit trees, care should be taken to remove, as far as possible, all roots and stumps, even though they be below plough

depth, in order to prevent, or at least to reduce to a minimum, the risk of attack by the root fungus *armillaria mellea* which, although primarily one of nature's scavengers and feeds on dead roots, yet it can—and so often does—leave the decaying roots and fasten on to the live roots of fruit trees with disastrous results. It is almost impossible to save the tree once the fungus has become firmly established.

VALUE OF BIRD LIFE.

The economic value of bird life is not generally realised, and often little appreciated by orchardists, who may adopt an indifferent or careless attitude towards its preservation.

It has been said that about 5 per cent. of the birds known to the fruitgrower as common visitants to his orchard are destructive in some way; but even these may be among the useful species, being insectivorous as well as fruit-eating. Some birds, while being more or less destructive during the fruit season, may do useful work in pest control the whole year round.

Because of their insectivorous habit, birds are Nature's agents in preserving balance by keeping insect pests from attaining plague proportions. Every orchardist should, therefore, assist in their protection, prevent as far as possible their indiscriminate slaughter for food or "sport," and preserve, where practicable, their breeding grounds.

SAVING OUR SOIL.

Surface drainage should be studied before laying out an orchard. In established orchards where it is found that surface wash and scouring is occurring, much can be done to prevent it. All surface water from above the orchard may be diverted by making a wide, shallow contour drain on the top side of the orchard, where the ground may be grassed. With a plough and scoop, this drain can be made usually at a very small cost. Depth and width will be determined by the volume of water to be diverted, but a drain about 4 feet wide and 18 inches deep, with the soil scooped on to the lower side, will do in most cases. This type of drain will not scour nor silt up readily, and if well grassed will need very little attention.

It should be remembered that a fall of 18 inches in every 100 feet is the correct grade for surface contour drains in a cultivated area.

To reduce loss of soil by the action of heavy rains on the cultivated areas, the planting of suitable cover crops should receive attention.

If it is not intended or desired to plant cover crops, it should be remembered that badly cultivated land with a hard pan near the surface will wash more severely than if good cultivation has been the rule.

Where the ploughing has been left in the rough it will be found that each furrow will carry its own water, whereas a final cross-ploughing tends to back the water up until it forcibly breaks through at a low point, generally causing a big run and considerable damage.

TRANSPLANTING TOMATOES.

When tomatoes are transplanted during summer, considerable loss is often caused by the young plants "burning off" at ground level. This is particularly noticeable where the soil is fine or sandy.

A dull day should be chosen for transplanting, but if the area is large and transplanting cannot be postponed, it should be done late in the day. Roll the stem of each plant in paper just before planting. This is best done by having a sufficient supply of papers cut to a suitable size—for the average size plant, about 4 inches by 1½ inches. The papers may be threaded on a string and suspended from the belt of the field worker for convenience in use. On taking a plant from the carrying-box or basket, the paper is snapped off the string and rolled round the stem of the plant—like rolling a cigarette—leaving only the top leaves and the root exposed. The plant may then be placed in the ground in the usual way. It will be found that after a little practice very little extra time will be required for this method of planting. Other advantages of this method are that the young plant does not readily droop, and soon becomes established. Where cutworms are troublesome, it also will give a good measure of control during the early stages of growth.

PROPPING BANANAS.

Loss of promising and superior fruit as the result of uprooting and breaking down caused during cyclonic weather in the Mons Marie variety shows the necessity for a system of propping that will reduce loss to an absolute minimum.

The method giving the best results is double propping, and it is carried out as follows:—Two stakes, 2 inches by 2 inches and approximately 12 feet long, are tied together about 1 foot from the end, and the tie wire left about 2 feet in length.

The two stakes are opened and the small fork or crotch formed by the union of the two stakes is placed at the correct height on the plant, and the length of wire is drawn round the stem and joined on the props.

When the two legs are firmly placed, and with the aid of the wire tie, it will be apparent that the plant will withstand a great amount of buffeting from the weather.

It is wise to place the props in position as soon as the plants have bunched, as it is noted that at this stage quite a large number are affected.

Another advantage of this method is that the bunch hangs between the two props, thus practically eliminating damage through rubbing.

For Cavendish bananas this method is just as practical, as the one-take system causes an appreciable loss through rubbing, but for this variety the length may be reduced to 9 feet.

GLADIOLUS THRIPS.

The gladiolus thrips is again active in southern districts, and in some gardens and nurseries the present crop of blooms will be of little value while subsequent crops will require protection from the pest.

The insect is a typical fringe-winged thrips about one-fifteenth of an inch in length and dark brown, sometimes almost black, in colour. Normally, both the adults and the small yellowish larvæ are confined to the more sheltered parts of the flower spike or the growing point, and the bulk of the injury is produced before the leaf or flower spike is unfurled. Colonies of larvæ may often be found in the small spaces between the closely-folded leaves of the plant and in the as yet unopened flower buds. The distinctive injury consequently often follows feeding on these younger parts of the plant prior to their emergence. Typically, symptoms are an uneven silvering on the surface of the leaves, malformations in and discolorations of the flower spike, and a general bedraggled appearance of the plant. Though the damage to the plant is obvious, a secondary effect is lack of vigour in the corms which is frequently not appreciated. Any set-back to the plant has an adverse effect on corms taken from it, and thrip injury is no exception to the rule. Control measures are, therefore, necessary not only for the current season's crop but also for that of the following year.

As with most species of thrips, reproduction is very rapid and populations may build up quickly to injurious levels. Continuous attention is therefore necessary, for it is much easier to retain control if treatment is applied before the plants are more or less "alive" with the insects. Similarly, corm protection is desirable to ensure freedom from infestation when planted out in the field. The essentials in control are therefore three—

(*a*) Corms should be fumigated in paper bags at the rate of 1 oz. naphthalene per 100 corms for a period of one week before being stored during the off season. A second treatment should be given just prior to planting out in the following season. If corrosive sublimate (1-1,000 for one hour) treatment is given before planting out, the second fumigation may be omitted.

(*b*) When planted out suitable sprays should be applied as soon as the thrips appear and at weekly intervals thereafter. If an outbreak was experienced in the previous season, it is better not to wait for the appearance of the thrips but to apply an initial treatment when the plants are about 6 inches high. The most efficient spray contains Paris green 1 oz., brown sugar 2 lb., and water 3 gallons. A mist spray is desirable, and it is important to agitate the contents of the pump frequently to ensure an even discharge of the toxic ingredient, Paris green. The cost of this spray is not excessive, but it has the disadvantage of occasionally burning the leaves. A more expensive spray, suitable perhaps for garden purposes, is said to be equally effective and at the same time less harmful to the plants. It contains tartar emetic 2 oz., brown sugar ½ lb., and water 3 gallons.

The derris wet sprays provide a further alternative method of dealing with the thrips, and, although they do not offer maximum efficiency, they are relatively inexpensive and convenient. Derris sprays should be mixed to the normal strength as recommended by the manufacturers and applied to the plants weekly.

(*c*) Where possible plantings should be arranged to allow a break of some months between seasonal operations, volunteer growth being suppressed throughout. In the absence of field hosts, the pest population will thus be at a minimum when corms are planted.

PINEAPPLE MARKETING.

When the summer smooth leaf pineapple crop in South Queensland is ready for market, the necessity of packing only good class, matured fruit will demand renewed emphasis.

There is always the tendency with some growers to pick the first shipments of pineapples too closely, with the result that these consignments lag on the Southern markets, waiting for the necessary colour to develop. Subsequent consignments arrive on top of an already loaded market, and have the effect of reducing prices. Complaints that pineapples are arriving far too green and are consequently very hard to move on the market are very common. Such fruit never ripens into an attractive condition.

Pineapples for the Southern markets should not be picked until there is a distinct sign of colour at the base of the fruit. Only fruit left until this stage will develop into a good eatable commodity.

None but good quality fruits free from sunburn, mechanical injury, or insect damage, and which are reasonably assured of being free from water blister, should be packed. Packing with woodwool is much preferable to grass; the pack always opens up cleaner and drier when the former is used.

Packing fruit to a nice grade is also a further factor in favour of a consignment. Any malformed fruit, or that which may have had the tops destroyed by frost, should not be packed. Cleanliness in the packing shed will keep the fruit free from most of the troubles which influence market values.

NEW CODLING MOTH ADVISORY SERVICE.

The Department of Agriculture and Stock recently announced the inauguration of a new codling moth advisory service which should make the control of this pest a simpler and more efficient job than previously.

For some time past it has been quite clear that there was little prospect of discovering sprays more toxic to the insect than those now in more or less general use, such as lead arsenate, white oil, and white oil combined with nicotine sulphate. Research has therefore aimed at improving the method of applying the sprays. The weakness in the past has been the difficulty experienced by the fruitgrower in deciding when cover sprays—that is, the sprays applied to the developing fruit—should be given to his trees. Recent work has brought to light two important facts about the insect which have a bearing on this problem. They are—

(1) That moth activity occurs in "bursts" during the season; and

(2) That eggs are laid mainly when these "bursts" of activity are in progress.

To determine when the moths are active, traps containing a cheap wine and water are hung in the orchard, and the activity of the moth can be estimated from the number caught. The new advisory service is based on the principle that continuous records of the number of moths in flight show when they are most active and thus when most of the eggs are being laid. From these observations it is possible for the expert to say definitely when sprays must be applied to give the best results. Timing sprays in this way is a marked advance in codling moth control methods, and during the current season the department is servicing a number of traps placed in various districts, and full publicity will, from time to time, be given to the spray dates during which growers in the Stanthorpe district ought to man their pumps and get to work spraying their apple trees.

The information as to spray dates will be broadcast over various wireless stations when received. Notices will also be posted up at railway stations and post offices in the Granite Belt and announcements will be issued through the Press.

Growers who apply their codling moth sprays as suggested in this service will find their spray costs reduced because the number of treatments will be the lowest possible without losing efficiency. In addition, doubt as to when to spray and when not to spray will no longer be a source of worry. There is therefore much to gain and nothing to lose by following the departmental recommendations in this matter, for the facts on which they are based are just as sound as science can make them.

A HORSE "COME BACK."

"If farmers will only go back to a greater use of horses in place of the mechanical power, which is taking so much out of their industry without giving compensating returns, they will help to win the war by conserving their resources and making agriculture a self-contained industry."

That is the opinion of a prominent Southern horse breeder who specialises in Clydesdales, and it is a point well taken. For, after all, if the war lasts very long there is sure to be a shortage of oil fuel for farming purposes and the position of farmers who have sold all their horses will not be easy.

The relative value of horses and tractors is still a topical subject at farmers' gatherings. It is a subject worth while studying from all angles. It is possible—no, probable—that one day we shall have an economic research institute which will settle this and many other questions bearing on farm management, supplies, and so forth. Such research would be of great value to the man on the land, because it would analyse questions of costs and expenditure, profit and loss, which are often outside the calculations of the average farmer.

The advice is now given to the rank and file farmer to breed from every good mare he possesses. Horse prices are high and are likly to remain so. Even when the war is over there will always be a demand for good farm sorts.

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

EARLY summer storms enhanced seasonal prospects for the stone fruit grower, although some of the fruit already on the market show evidence of the effects of an adverse spring in some localities.

The market for tomatoes has been up and down alternately. Opening at a high price level the market was spoilt badly by a revival of the practice of consigning immature fruit by growers who ought to know better.

Most other fruits continued at payable margins throughout November.

Prices at the end of the month were:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Sixes, 11s. to 12s. 6d.; sevens, 10s. to 14s. 6d.; eights and nines, 12s. 6d. to 16s.

Sydney.—Sixes, 10s. to 14s.; sevens, 14s. to 17s.; eights and nines, 17s. to 20s.

Melbourne.—Sixes, 13s. to 16s.; sevens, 15s. to 18s.; eights and nines, 17s. to 21s.

Adelaide.—To 22s. for choice fruit.

Newcastle.—Sixes, 13s. to 15s.; sevens, 16s. to 18s.; eights and nines, 17s. to 20s.

Pineapples.

Brisbane.—Smoothleaf, 5s. to 7s.; loose, 2s. to 7s. dozen; Ripleys, 8s. to 10s. case; loose, 1s. 6d. to 6s. 6d.

Sydney.—Smoothleaf, 8s. to 13s.

Melbourne.—Smoothleaf, 9s. to 15s.

Newcastle.—Smoothleaf, 9s. to 12s.

Water blister prevalent in Southern consignments. Careful handling is required during wet, hot periods.

Papaws.

Brisbane.—Yarwun, 5s. to 7s. tropical case; Gunalda, 3s. 6d. to 5s. bushel; Locals, 2s. to 3s. bushel.

Sydney.—2s. to 9s. tropical case.

Melbourne.—5s. to 10s. tropical case.

Newcastle.—8s. to 10s. tropical case.

Mangoes.

Brisbane.—4s. to 8s., specials higher.

Sydney.—15s. to 20s.; special varieties only wanted.

Melbourne.—18s. to 22s.; special varieties only wanted.

CITRUS FRUITS.

Oranges.

Brisbane.—13s. to 15s. bushel.

Lemons.

Brisbane.—Locals, 11s. to 15s.; Gayndah, 15s. to 20s.

STONE FRUITS.

Cherries.

Brisbane.—5s. to 10s.; choice to 13s.

Apricots.

Brisbane.—9s. to 13s. half bushel; small lower.

Plums.

Brisbane.—New South Wales Wilson, 5s. to 10s. half bushel.

Peaches.

Brisbane.—Stanthorpe Mayflower, 7s. to 9s. half bushel; China Flats, 1s. to 4s. tray.

OTHER FRUITS.

Passion Fruit.

Brisbane.—8s. to 12s. half bushel.

Sydney.—10s. to 15s. half bushel.

Melbourne.—10s. to 18s. half bushel.

Tomatoes.

Brisbane.—Ripe, 1s. to 3s.; coloured, 1s. 6d. to 5s.; green, 1s. 6d. to 4s.

Sydney.—Cleveland, 4s. to 6s. half bushel.

Newcastle.—5s. to 6s. half bushel.

VEGETABLES.

(Brisbane unless otherwise stated.)

Cabbages.—2s. to 7s. dozen. Good Stanthorpe higher to 10s.

Beans.—7s. to 10s.

Peas.—6s. to 8s.

Parsnips.—3d. to 1s. 6d.

Carrots.—3d. to 6s. *Sydney:* 2s. to 4s. a quarter.

Lettuce.—6d. to 1s. dozen.

Pumpkins.—4s. to 8s.

Marrows.—6s. to 2s. 6d. dozen.

Cucumbers.—3s. to 3s. 6d. bushel. *Sydney*: 5s. to 8s. bushel.

Rhubarb.—6d. to 9d. bundle.

Beetroot.—3d. to 8d. bundle.

Rockmelons.—*Brisbane*: 3s. to 10s. dozen. *Sydney*: 12s. to 16s. bushel.

Watermelons.—7s. to 24s. dozen.

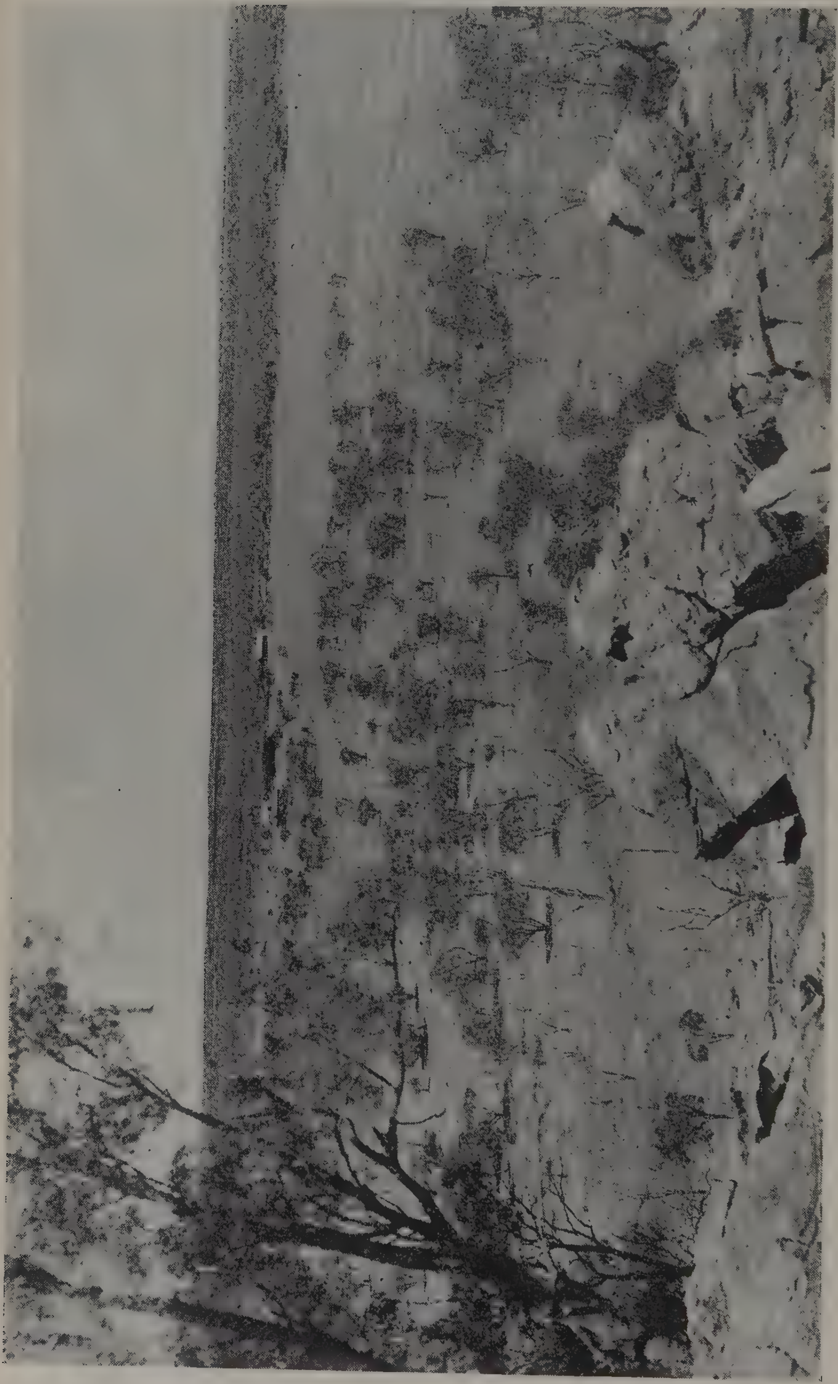


Plate 297.

A Western Queensland Landscape.—Outlook from Solomon's Temple, over the Strathdarr country, near Longreach, the homestead and station buildings in the mid-distance.

Plate 298.

On the Home Pasture.—Brood draught mares and foals, showing bone and quality, on Paradise Downs, Blackall, Western Queensland.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, the Friesian Cattle Society, and the Guernsey Cattle Society, production charts for which were compiled during the month of October, 1939 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	JUNIOR, 4 YEARS (STANDARD, 310 LB.).			
Alfa Vale Gwen 5th	W. Hinrichsen, Clifton	7,908·25	332·442	Reward of Fairfield
	SENIOR, 3 YEARS (STANDARD, 290 LB.).			
Jamberoo Broady II.	N. Bidstrup, Warra	10,251·66	412·955	Brookland Terrace Banker
Valera Sheila 3rd	Sullivan Bros., Pittsworth	8,089·5	332·369	Rosenthal Lord Bine
Jamberoo Rosie III.	N. Bidstrup, Warra	8,582·77	331·303	Banker of Brookland Terrace
	JUNIOR, 3 YEARS (STANDARD, 270 LB.).			
Ardilea Flower	W. Hinrichsen, Clifton	7,195·75	313·135	Midget Sheik of Westbrook
	SENIOR, 2 YEARS (STANDARD, 250 LB.).			
College Stately Lady	Queensland Agricultural High School and College, Lawes	8,235·13	299·452	College Sergeant
College Grandeur	Queensland Agricultural High School and College, Lawes	7,192·78	298·861	Trevlac General
Dulcie 3rd of Lynfield	F. E. Birt, Box 31, Gympie	6,821·9	287·515	Springdale Surprise
	JUNIOR, 2 YEARS (STANDARD, 230 LB.).			
Star 5th of Alfa Vale (365 days)	W. H. Thompson, Alfa Vale, Nanango	12,635·45	539·583	Reward of Fairfield
Glenroy Betty (365 days)	W. F. Kajewski, Glenroy, Glencoe	12,855·95	518·592	Parkview Glider
Glenroy Bluebell 2nd (365 days)	W. F. Kajewski, Glenroy, Glencoe	12,064·25	507·103	Blue Boy of Glenthorn
Ehlma Park Gentle	N. Bidstrup, Warra	8,415·84	319·161	Mount Blow Monash
College Rapture	Queensland Agricultural High School and College, Lawes	7,983·68	317·112	Trevlac General
Navillus Princess 5th	C. O'Sullivan, Navillus, Ascot	7,703	284·91	Alfa Vale Re Nell
College Rascal 8th	Queensland Agricultural High School and College, Lawes	6,016·15	270·336	Fussy's Kitchener of Hillview

College Wendie 2nd	Queensland Agricultural High School and College, Lawes	6,491·24	269·203	College Sergeant
Happy Valley Dolly	R. R. Radel, Coalstoun Lakes	6,011·7	263·345	Sunnyview Artist
Glen Idol Muriel	Estate of P. Doherty, Box 31, Gympie	6,000·65	260·757	Excellency of Blacklands
Valera Roseleaf	Sullivan Bros., Pittsworth	6,054·21	247·649	Rosenthal Lord Bine.
JERSEY.				
SENIOR, 3 YEARS (STANDARD, 290 LB.).				
Bellgarth Vera Belle	P. Kerlin, Killarney	5,799·5	313·049	Bellgarth Golden King
College Floss 2nd	Queensland Agricultural High School and College, Lawes	6,846·29	309·203	Bellgonia Peggy 9th Duke
JUNIOR, 3 YEARS (STANDARD, 270 LB.).				
Trinity Chiming Princess	G. Champney, East Wooroolin	6,290·4	357·307	Trinity Nobly Born
Windyway Nightshade	Wakefield Bros., Upper Barron, Atherton	5,320·55	285·82	Royal Emblem 2nd of Rosedale
SENIOR, 2 YEARS (STANDARD, 250 LB.).				
Ellerdale Wonder's Golden 3rd	Farm Home for Boys, Westbrook	6,109·55	298·710	Mildred's Wonder
Peeramon Princess Rose	A. H. O. Koppen, Perramon	5,941·1	297·041	Trinity Popcorn 2nd Pioneer
College Starbright 7th	Queensland Agricultural High School and College, Lawes	4,993·35	258·843	Belgonia's Peggy 9th Duke
JUNIOR, 2 YEARS (STANDARD, 230 LB.).				
Grangevale Memo	T. Gillespie, Ravenshoe	6,257·7	333·026	Banyule Supremacy
Glenview Twinkle	F. P. Fowler and Sons, Coalstoun Lakes	6,764·25	316·006	Trinity Governor's Hope
College Fleur 2nd	Queensland Agricultural High School and College, Lawes	5,173·84	278·293	Belgonia's Peggy 9th Duke
Trinity Heiress	G. Champney, East Wooroolin	5,097·97	273·767	Trinity Nobly Born
Westbrook Safety 17th	Farm Home for Boys, Westbrook	4,999·6	270·68	Oxford Gem's Ambassador
Windyway Maiden	Wakefield Bros., Upper Barron, Atherton	4,880·5	254·218	Royal Emblem 2nd of Rosedale
Grangevale Gloria (251 days)	T. Gillespie, Ravenshoe	5,002·25	232·325	Banyule Supremacy
FRIESIAN.				
JUNIOR, 3 YEARS (STANDARD, 270 LB.).				
St. Athan's Piebe Nolly	F. C. Noller, Kumbia	11,813·41	436·12	Greenvale Segis Piebe 3rd
GUERNSEY.				
JUNIOR, 2 YEARS (STANDARD, 230 LB.).				
Laureldale Olga 3rd	W. A. Cooke, Laureldale, Witta	5,324·9	246·492	Laureldale Peer

General Notes

Staff Changes and Appointments.

Mr. A. F. S. Ohman, Government Veterinary Surgeon, Toowoomba, will be transferred to Brisbane.

Mr. F. Stanfield, the Poultry Farmers' Co-operative Society, has been appointed an honorary inspector under *The Diseases in Poultry Acts.*

Mr. D. C. Colyer, Lowmead, has been appointed an honorary protector of fauna.

Mr. E. A. Crosser, a member of the Rural Development Board, has been appointed acting deputy chairman of the board, and Mr. W. Bell, Department of Public Lands, has been appointed deputy member of the board, during the absence of Mr. J. L. Callaghan, deputy chairman, on official business.

Mr. E. B. Rice, Dairy Technologist, Department of Agriculture and Stock, Toowoomba, has been appointed Acting Director of Dairying.

Mr. P. P. Comiskey, District Inspector of Stock, Department of Agriculture and Stock, will be transferred from Emerald to Rockhampton.

Mr. J. P. H. Clark, Inspector of Stock, will be transferred from Gladstone to Emerald.

Mr. H. N. Whitaker, Gordonvale, has been appointed millowners' representative on the Mulgrave local sugar cane prices board, in place of the late Mr. W. F. S. Howe.

Mr. P. Volp, Mulgrave Cane Disease Control Board, Gordonvale, has been appointed an honorary inspector under *The Sugar Experiment Stations Acts.*

Mr. O. B. Farrelly, Lagoons, Mackay, has been appointed an honorary protector under *The Fauna Protection Act.*

Mossman and Hambledon Cane Diseases Control Boards.

An Order in Council has been issued under "*The Sugar Experiment Stations Acts,* 1900 *to* 1938," constituting the Mossman and Hambledon Cane Diseases Control Boards in and for the cane disease infested areas comprising the Mossman and Hambledon mill areas.

Honorary protectors appointed under "*The Fauna Protection Act of* 1937," include Messrs. R. G. Hollis, of Mandalay, Fig-tree Pocket; C. H. Westcott, Sunnyside, via Sarina; and V. O'Neill, Springcliffe, via Mackay; and C. Patrick, Mount Glorious.

Following is a list of new appointments as honorary fauna protector and honorary ranger under "*The Native Plants Protection Act of* 1930":—Messrs. S. A. Best, L. Harden, W. Nicklin, H. Cuff, R. Dobson, Charles Patrick, R. Moss, J. Batterham, K. E. H. Webber, and C. Morrison.

Tully Cane Growers' Levy.

Regulations have been issued under the Primary Producers' Organisation and Marketing Acts empowering the Tully River District Cane Growers' Executive to make a further levy for administrative purposes at the rate of ½d. a ton on local canegrowers. This is additional to the levy of 1¾d. approved in July last.

Wild Life Preservation.

An Order in Council has been issued under "*The Fauna Protection Act of* 1937," declaring the town of Redcliffe and portion of the shire of Pine to be a sanctuary under the abovementioned Act.

In 1909 the Redcliffe Shire was declared a sanctuary under "*The Native Birds Protection Acts,* 1877 *to* 1884," and the Order in Council redefines the boundaries of the original sanctuary.

Milk Board.

An Order in Council has been issued under *The Milk Supply Act of* 1938, declaring that the number of representatives of producers on the second Brisbane milk board shall be three, and the number of representatives of wholesale vendors on the board shall also be three.

Packing of Apples.

A Regulation issued under *The Fruit and Vegetables Acts* provides that every case or package in which apples may be sold shall be a wooden case, as prescribed, and that no person shall sell any apples unless the same are so packed.

Sulphate of Ammonia an Essential Agricultural Requirement.

An Order in Council approved under *The Agricultural Requirements Control and Conservation Act of* 1939, declares that sulphate of ammonia and any fertilizer mixture containing any of such substance shall be essential agricultural requirements for the purposes of the Act.

Assistance to Wheatgrowers.

An Order in Council has been issued under *The Wheat Stabilisation Act of* 1938,'' determining that the basis on which moneys granted to the State by the Commonwealth by way of financial assistance shall be distributed to wheatgrowers shall be a payment to each wheatgrowers of one penny and nine-sixteenths of a penny for each bushel of wheat grown in Queensland, and harvested on or after 1st October, 1938, which has been sold or delivered for sale during the year in respect of which the payment is made to the State.

An Order in Council issued in May last provided for a payment of twopence a bushel.

Essential Agricultural Requirements.

The Agricultural Requirements Control and Conservation Act of 1939 came into operation on 16th November, 1939.

An Order in Council also has been approved under this Act, declaring the following to be essential agricultural requirements for the purposes of the Act:—

Sulphate of potash (potassium sulphate),

Muriate of potash (potassium muriate) chloride of potash (potassium chloride),

Plant ash containing potash,

Any other substance containing potash, which substance is capable of being used for fertilizing purposes, and

Any fertilizer mixture containing any of such substances.

Papaw and Tomato Levy.

Executive approval has been given to the extension of the Papaw and Tomato Levy Regulations issued under *The Fruit Marketing Organisation Acts,* 1923 *to* 1934, and enforced by the Committee of Direction of Fruit Marketing, the former levy for a further twelve months from 9th December, 1939, and the latter for two years, from 31st December, 1939.

Central Sugar Cane Prices Board.

The Central Sugar Cane Prices Board has been constituted from the 13th November, 1939, to consist of the following members:—

His Honour, Mr. Justice W. F. Webb, Messrs. T. A. Powell (canegrowers' representative), E. S. Smith (millowners' representative), J. McC. MacGibbon (qualified sugar chemist), and A. R. Henry (a person experienced in accountancy and audit; also to act as secretary to the Board).

It has been approved that Mr. Justice Webb shall act as chairman of the board.

Good Litter Records.

''Port Curtis Bonetta I,'' a large white sow, owned by Mr. W. C. Paroz, Biloela, has recently completed her second litter record under the litter recording plan of the Department of Agriculture and Stock, with results which should interest pig breeders. On the 9th March, 1939, she farrowed her first litter, 12 pigs, and reared them all so well that the litter weighed 659¾ lb. at 56 days of age, an average of 54.98 lb. per pig. On the 6th September, the sow farrowed her second litter, 13 pigs; one was killed when a month old, and the remainder weighed 514 lb. at 56 days of age, an average of 42.83 lb. per pig.

As heavy weights at weaning are important in marketing stock early, all pig breeders will appreciate the value of this sow's prolificacy and ability to give her pigs a good start.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of Mr. W. D. Francis, Botanist.

Native Tobacco.

A.W.J. (Brisbane)—

The specimen (*Nicotiana suaveolens*) is the common native tobacco of western parts of the State. It is found as well in some of the drier areas nearer the coast, such as on the western parts of the Darling Downs. It should not be confounded with the common wild tobacco, which is common in the cleared rain forests and scrub areas of coastal parts of the State.

The native tobacco contains the alkaloid nicotine. It has been proved by feeding tests to be poisonous to stock. Apparently, its poisoning properties are due to its nicotine content. In feeding tests in New South Wales, conducted by Seddon and McGrath, it was found that 12 oz. of the dried leaves of the plant were repeatedly poisonous to sheep, but that small doses less than 12 oz. were not poisonous. The results of these feeding tests explain why it is that graziers and others have noticed sheep eating it to a limited extent without any ill-effects following. In such cases, it is evident that sufficient quantities of the plant were not consumed.

"Tumbling Mustard."

S.G.W. (Mulgeldie)—

The weed is tumbling mustard or oriental rocket (*Sisymbrium orientale*). It is a native of Europe, the Orient, and the Himalayan region, and is fairly common in cultivations in Eastern Australia during the winter and early spring months. It is an annual plant which belongs to the Crucifer family (*Cruciferæ*). If plentiful in a pasture, it would most likely taint the milk of cows which eat it. It is not poisonous.

Rockhampton Grass Specimens Named.

Inquirer (Rockhampton)—

The specimens have been determined as under. None of them could be classed as good dairying grasses, and only a few are of any use for fattening.

1. Common vervain (*Verbena officinalis*). This is not a grass, but belongs to the same plant family as the lantana. It is sometimes very common in the pasture, and occurs also as a weed on farm headlands, fallow land, and similar places. It is rarely touched by stock.
2. Paddock love grass (*Eragrostis leptostachya*). This makes quite a useful addition to the average native pasture, and at times is fairly plentiful. It can scarcely be classed as a good grass, however.
3. Bunch spear grass (*Heteropogon contortus*). In its younger stages, this is quite a good fattening grass, but as it matures it becomes rather coarse, and the "spears" are developed. These "spears" at times cause severe mechanical injury to grazing animals.
4. Barbed wire grass (*Cymbopogon refractus*). This species has a poor reputation as a fodder, and tends to replace the better class kangaroo grass in the coastal open-forest country as the kangaroo grass becomes eaten out.
5. A three-pronged spear grass (*Aristida* sp.). Probably this is the same as No. 7, but in the absence of "spears" it is impossible to be sure.
6. A Star grass (*Chloris* sp. (?). This specimen is too fragmentary for identification, but appears to be one of the star grasses, most of which are of a limited value in the native pastures.
7. A three-pronged spear grass (*Aristida latifolia*). This is rather a coarse, robust species which is of little value as a fodder.

"Wild Flax" or "Broom Bush."

H.R.S. (Yeerongpilly)—

The plant specimen is *Pimelea trichostachya*. It is observed that the specimen has been referred to as "broom bush." Several years ago when in the Quilpie district, we heard it referred to as "wild flax." In that district it is reputed to be poisonous to stock. The plant has a peculiar and rather objectionable smell in the field. Even when some distance away from it, when the wind is blowing over it towards one, this unpleasant smell is noticeable. At the time of our visit to the Quilpie district, it was very dry, and some of the sheep were being shifted farther east. There was a considerable quantity of this plant growing in patches, and often in flower. It had the property in some way of remaining green and healthy-looking when the rest of the vegetation was suffering from the effects of the drought. We saw no indications anywhere of the plant being eaten by stock.

White Cedar—Poisonous to Pigs.

J.H. (Rosevale)—

The fruit of the White Cedar is poisonous to pigs. The poisonous principle of this fruit is not known. Some chemical work carried out at the Technological Museum in Sydney yielded a resinous material from the fruit, and it is thought that this resinous material may contain the poisonous principle. We have had no experience which suggests that the fruit of the White Cedar is not poisonous in August and September.

A Rib Grass.

T.A.F. (Brisbane)—

The plant is one of the rib grasses. It is a Queensland native, and is generally regarded as a good fodder. The seeds should be suitable for feeding to birds. The botanical name of the plant is *Plantago varia*.

Prickly Milk Thistle. Prickly Lettuce.

W.R.S. (Gympie)—

1. Prickly milk thistle (*Sonchus asper*). It is widely spread in different parts of the world, and is very closely allied to the common milk thistle (*Sonchus oleraceus*). As a matter of fact, it is often placed merely as a variety of *Sonchus oleraceus*.

2. Prickly lettuce (*Lactuca Scariola*). At times this plant has been suspected of being poisonous, but nothing definite has been proved against it. So far as we are aware, it is a useful fodder when eaten with grass and other herbage.

A Barley Grass.

H.A.L. (Nanango)—

The specimen is *Hordeum leporinum*, a barley grass, sometimes known as wall or mouse barley. It is a native of Europe, but has been naturalised for many years in Australia, more particularly in the Southern States. In its earlier stages, it is said to be quite a useful fodder, being a winter-growing species. Towards maturity, however, it loses its nutritive value rapidly, and by summer, consists of dried stalks, a field of it somewhat resembling wheat after harvesting. Further, the seed-heads cause trouble to sheep, particularly becoming caught in the wool and piercing the skin and eyes. The hard, pointed seeds also pierce the mouth and cause at times bad sores, even in severe cases decay of the facial and jaw bones have been attributed to this cause. In the circumstances, it cannot be recommended as a fodder species.

Variegated or Lady Mary Thistle.

A.G.S. (Goondiwindi)—

Your specimen is the variegated thistle or Lady Mary thistle (*Silybum marianum*). It is a native of Europe and Western Asia, and is fairly common in parts of the Darling Downs. It has been declared a noxious weed for the State. At times it has caused poisoning in stock, as sometimes it developes a prussic-acid-yielding substance. Because of the prickly nature of the plant, and the fact that it is sometimes poisonous, it would be as well to eradicate it.

Broom Bush or Wild Flax. Tobacco Plant. Bottle Brush.

J.L. (Yeerongpilly)—

The broom bush (*Pimelea trichostachya*) is reputed to be poisonous in the Quilpie district; where it is known as wild flax. It is a drought-resisting plant, and we have noticed it quite green and flowering when the grass and herbage had disappeared. Even in dry times, the plant is avoided by stock. The wind, when blowing towards one from these plants, even when they are some distance away, is charged with the peculiar disagreeable odour of them.

The tobacco plant is *Nicotiana suaveolens*. This plant was experimented with in New South Wales by Seddon and McGrath, who found that 12 oz. of the dried leaves was poisonous to sheep, but that doses less than 12 oz were not fatal. However, animals have been observed to eat the plant without ill-effects. This is probably explained by the fact that the lethal quantity was not consumed.

The bottlebrush weeds are various species of *Trichinium*. These are ornamental plants, which belong to the Amaranth family, and which are not known to be poisonous to stock.

Climbing Buckwheat.

C.H.L. (Gayndah)—

The weed is the climbing buckwheat (*Polygonum convolvulus*). It is not known to be poisonous to stock, and so far has not become a serious pest. In eradicating the plant and checking its spread, the treatment should aim at preventing seed developing. If practicable, the plants should be hoed out before they seed.

Scarlet Pimpernel.

W.A.T.S. (Nambour)—

The specimen is the scarlet pimpernel (*Anagallis arvensis*). It is a native of Europe and temperate Asia. It is reported to be poisonous to sheep, 22 oz. in two days being found to produce death. However, it is considered that larger animals, such as cattle, do not eat sufficient quantities to cause poisoning. Because of that, it has been decided not to proceed with investigations by the Poison Plants Committee of this department. There is a blue-flowered variety of this species.

Creeping Knapweed.

L.N.D. (Cambooya)—

The specimen is the creeping knapweed (*Centaurea repens*). It is a native of the Eastern Mediterranean region, and has been established in Queensland for some time, particularly on the Darling Downs. It is a serious weed pest, and is difficult to get rid of. The best mechanical means of eradicating it is by repeated cutting of the plants below the surface of the ground, thus preventing the green parts growing and supplying the underground parts with nutrients. If stock can be kept off the area infested with the weed, spraying with arsenic pentoxide could be done, although it is not likely that only one spraying would effectively kill the weed. "Weedex" is not so poisonous as arsenic pentoxide. It is quite likely that several sprayings with "Weedex" would be necessary. It is not the skeleton weed.

Prairie Grass.

R.W.L. (Moolboolaman)—

The specimen is *Bromus unioloides*, commonly known as prairie grass. It is native to America, and was introduced many years ago as a fodder. Since then it has become naturalised in many parts of Central and Southern Queensland, frequently occurring as a weed of waste or cultivated ground and in gardens. It is a winter-growing annual which reaches maturity in the spring and early summer, and is cultivated to some extent as a fodder in southern areas, where the autumn-spring rainfall is sufficient. The grass thrives on a good loamy soil, but sandy soils are unsuitable. It is both palatable and nutritious, the chief limiting factor to its use being the unsuitability of the rainfall in most districts, except in southern portions of the State. A perennial form does occur, but has not yet been exploited to any great extent. Although the annual form dies off in the summer if allowed to seed, it reseeds fairly well.

Rural Topics

Industry and Progress.

"Your refusal to be satisfied is industry's hope for progress. It is your desire for new comforts and new services that stimulates the imagination of industry and spurs its action. Industry knows that the novelty of yesterday becomes the necessity of to-day.

". . . . And so it is that from your 'divine discontent' by your refusal to be satisfied with things as they are, industry pushes forward. The scientist in his laboratory feels the urge of your desires. The inventor in his shop knows that you are waiting. The worker in the factory is conscious that the labour of his hand and brain brings things worthwhile into your life. . . . . The merchant and distributor bring these products within your ready reach. These are the means industry uses to meet your demands. Industry must continue to hope that you are not satisfied."—R. J. Hamilton in *"Stories of American Industry."*

Variety in Stock Feeding.

The flesh-forming materials in foods (proteins) are composed of units termed amino acids. These amino acids are synthesised by plants, but it is very doubtful whether they can be "manufactured" by vertebrates.

The most useful proteins are those which contain the greatest variety of amino acids. For this reason, animal by-products—milk, eggs, flesh, &c.—stand alone. If a vegetarian diet is to be persisted with, it must be selected from a wide range of foods so that the missing amino acids in one material way may be made up from another. This explains the benefits of variety in live stock feeding.

Risk of Feeding Raw Offal to Pigs.

On many farms a fat beast is killed occasionally for domestic use. Portions of the carcase and viscera are sometimes fed raw to pigs. These form a valuable pig food if cooked; but, if fed raw, the health of animals may be endangered. For example, when an animal is affected with tuberculosis, the primary lesions in the organs, being small, may escape detection. Although the carcase may not be grossly affected, there is a real danger to pigs—especially young ones—if fed with uncooked material from a diseased beast.

Under the Cattle Slaughtering Act, the Diseases in Stock Act, and the Pig Industry Act, the feeding of any meat offal or blood to pigs, unless it is thoroughly cooked, is a serious offence.

Shade for Pigs.

During the summer adequate shade for pigs should be provided. The ordinary sty, particularly if it has an iron roof, is very hot, and some other shade is necessary in the heat of the day. If there are no trees nearby, a wooden shed will answer the purpose.

Another important aid to the health and comfort of pigs is a bath in which they can lie in hot weather. To wallow in the mud is the pig's natural method of cooling itself. Unfortunately, the wallow sometimes seen on the pig farm is a filthy puddle-hole. If there is infection of any kind in the yard, it is to be found in just such a place. Dirty wallows should be drained and filled in, and a concrete or similar bath provided. This can then be kept clean, and the liability to infection will be diminished.

Comfortable and hygienic conditions are most important in maintaining the health and wellbeing of pigs.

An Important Point in Calf Feeding.

It is very important that calves should be fed separately. The practice of feeding the whole mob out of tubs or troughs must be condemned strongly, because it allows the fast drinkers to get too much milk at the expense of the others. It also tends to the formation of a bad habit. The young calves drink faster than they should, which causes a variety of digestive troubles. Slow drinkers grow best when they get their full ration of milk.

Proper pens or bails for calf feeding are well worth the time or money entailed. Too often there is a complete lack of conveniences for this important routine job.

Corn Cob Charcoal for Pigs.

A good use for the corn cobs (cores) that accumulate on most farms, and around piggeries, is to make charcoal of them. The cores are of little value as a food for pigs because of their coarse, dry fibre content, and even if the whole cob (grain and core) were ground, it is doubtful whether it would be worth the trouble.

After the pigs have chewed all the corn from the cob, the waste cores and husks may be raked together into a pile and burned. When the heap is a mass of red hot coals water may be poured over the pile. The partially charred cores, when cold, may be gathered for the pigs. Bones should also be gathered and burned, and added to the charcoal made from the cores. This cleaning-up serves a double purpose; it gets rid of matter that would otherwise accumulate and become a nuisance, and provides charcoal and mineral matter for the pigs.

Valuable Pig Foods.

Skim milk and buttermilk—they should not be mixed with wash water—are of equal feeding value. These dairy products supply all the protein necessary to balance the carbohydrate content of the grain portion of the pig's ration. Together with lucerne, rape, barley, or other green feed—which may be either grazed or fed in the pig pen—they form an excellent ration.

Dairy Farm Layout.

There are two necessary adjuncts to a dairy farm which are often looked for in vain—a crush and an isolation paddock.

A crush is necessary for the handling of bulls and young stock, but few dairy farms are equipped with one.

An isolation paddock is very necessary, but is rarely provided.

How many diseases could be checked if a farmer had a good isolation paddock in which he could place and watch a suspected animal, without any danger of the animal coming into contact with the rest of his herd?

Heredity in Sheep.

None of the domestic animals respond quicker to careful breeding than the sheep.

It may be taken with some exceptions, admittedly, that like begets like—hence the importance of what is called prepotency in the sire. This power is especially important in the merino, when it is estimated that fully 80 per cent. of the animal's qualities are in the fleece.

To the careful student of breeding, prepotency in the sire is chiefly indicated in the head. This must be entirely masculine, with a bold eye, strong horn, well sprung, and with the head and neck well let into the shoulders. No matter how well a ram is covered, if the head is wrong disappointment usually follows his use in the stud.

The quality, conformation, and constitution of the ewes, too, is of great importance, and it is in the successful ''nicking'' of the sexes that the truly great studmaster shows that inherent gift which is born with him.

Marketing Passion Fruit.

With the coming of warmer weather, passion fruit growers should exercise greater care in the harvesting of their fruit. Fruit should not be allowed to fall from the vines, as fallen fruit quickly become crinkled, reducing its size and value to the retailer. By picking the fruit when it is showing half colour its marketing life will be greatly increased, and its selling value raised. Where a grower has a percentage of crinkled fruit, it should be included with marked and blemished fruit and packed separately from the uncrinkled fruit. While most retailers have no outlet for crinkled fruit, there is, however, a good market otherwise for fruit of this description.

All fruit should be carefully handled and packed on the diagonal system, which gives the fruit the maximum of protection and display value, thereby enhancing its general appearance.

Sea Gulls in Insect Control.

Seagulls are useful allies of the farmer in destroying pests—that has been found out in England where gulls have done very good service for farmers by devouring myriads of grass grubs. Accurate observers of the habits of seagulls have a very large credit balance in their favour as friends of humanity.

Saving Wool Scour Wastes.

There seems to be no reason why much of the wool to be shipped from Australia under the Imperial wool purchase scheme should not be scoured here, instead of being sent away in the grease.

In sending greasy wool abroad huge quantities of dirt as well as grease—seldom less than 50 per cent.—are actually shipped, and thus take up much space which could be filled with other export commodities.

In war time, when every ton of freight space counts, it does seem absurd to go on sending hundreds of thousands of tons of "waste" to the Old Country, when by extracting it from the wool here, we would not only save freight, but would provide more work in our own wool scouring industry and, what may be of equal importance, retain all the by-products of the wool scour.

Of course, it is known that British manufacturers always like to get the bulk of our wool in grease and scour it to suit their own requirements, but there seems to be no good reason why that practice should be continued at a time of national emergency. Scoured wool may be difficult to sort—and that is why, no doubt, British top makers prefer to get it in the greasy state. But it should not be impossible to do the sorting here before scouring.

Another point of particular interest at the present time is that the chemicals contained in the yolk of sheeps' wool—potash, for instance—could be saved. The value of this, as well as of lanoline and other fats, is recognised, but in the past most of these have been run off with the dirt of the scour. To-day, we obviously cannot afford to waste any product which might be of value. During the last war it was found profitable to recover potash from the wool in the wash, but only in a small way. With an extension of the scouring industry—which would naturally follow if we decided to ship our wool as scoured instead of greasy—the possibilities would become very much greater, and it might pay to build special plants at various centres to extract at least some of the valuable by-products of the scour.

A start might be made with the low-grade wools, the dirt and grease content of which is frequently as high as 75 per cent. To scour these would reduce their bulk by probably three-fourths, thus economising on shipping space to the benefit of other exports.

The Uses of Milk.

Many things are being made from milk, quite apart from the usual dairy products. In Canada there are several factories for making casein from milk and from casein other factories make buttons, imitation ivory, furniture glue, binder for paints, sizings, and many other commodities. One factory buys whole milk, skims it, and makes butter from the cream. The skim milk is used in casein; the lactose, or milk sugar, is used as a supplement in baby foods; the albumen is separated out and, being rich in protein and vitamin C, is used as an animal concentrate. In fact, all that is left of the milk when the factory is done with it is water.

Fodder Values.

The Danes were the first farmers to speak in terms of fodder units, and, as the result of experiments in Denmark, every intelligent Scandinavian farmer knows the relative feeding value of nearly every stock food used in his country. For convenience, they take a pound of barley, the food with which they are most familiar, as the unit, and compare the relative values of all foods with that pound of barley. This fodder unit of a pound of barley equals 6 lb. of separated milk, 12 lb. of whey, 10 lb. of mangels, 12½ lb. of turnips, 2½ lb. of meadow hay, 4 lb. of oat straw, and so on.

War Time Farming.

Victory in the war will rest very largely with the farmers of the Empire, but especially those of Great Britain who are so close to scenes of naval and military action. This fact is recognised by all concerned. A very interesting development is the number of women and girls who are joining the Women's Land Army. Volunteers include shop assistants, typists, hairdressers, waitresses, farmers' daughters, and others who live at home. Landlords are working in the field alongside their tenants and farm workers, getting in the harvest.

The Women's Land Army is proving one of the most popular of the auxilliary services. In addition to the volunteers so trained in peace time, a large number of women have started their training since the outbreak of war, and before long there should be an immense body of trained or partially-trained and efficient women to assist with the Old Country's most vital industry—agriculture.

The Place of Wool in the Textile Trade.

The question often arises as to whether wool can hold its place in the textile world. At present there does not seem much doubt about it, but we can't measure yet the extent to which substitutes may be used as a war time necessity, especially in countries dependent largely on outside supplies. We have to admit, too, that wool substitutes have increased greatly in recent years, even to the extent of overthrowing old customs. Still it would be unwise to overemphasise the threat of these new materials to natural wool, but it would be equally unwise to underestimate it. Wool continues a long way in the lead of competing fibres. But to keep that lead we certainly have to increase our knowledge of wool, and apply any useful information or experience as soon as possible.

It seems a fair prophecy that, within ten years, substitutes will be produced not as cheaply as wool, but with virtues similar to those of the natural product. It is for this reason that intense scientific effort is necessary to keep wool ahead of all other textiles, and pastoralists and sheep men generally are showing their foresight in supporting much scientific work on all phases of wool production and use.

It also has to be admitted that like some other commodities, wool cannot hold its place in competition with artificial fibres by relying on its own traditional virtues. The position of wool in the commercial world has been attacked with some success by the chemist, but there is plenty of scope, and even plenty of time for it to fight back, although every day is valuable.

So it is a fair answer to the fair question: "Can wool hold its place in the textile world?" that it can, but to do so it must enlist the resources of all branches of science. And so the veterinary workers are wanted to prevent stock diseases, and the men of science on the breeding side must be called on to improve the quality and quantity of wool produced. That means, too, a reduction of costs, which also is of immense importance to the industry. On the technical side, the chemist and his co-workers in science must remove any disadvantages which are inherent in wool, and they may even improve it so well in other respects that wool may be able to compete even more strongly as a textile fibre.

Rough Riders and Rough Horses.

With the Light Horse, Field Artillery, and other mounted units in camp, arguments about buckjump riding and "outlaws" are continually cropping up, especially among "boys from the bush."

We have all seen rough riders in action, and, some of us anyhow, have had more than a passing acquaintance with horses that can "root a bit." Even a passing acquaintance may have been on such occasions when a knowing horse has decided to "turn us down and go alone."

From the days of Dargan's Grey—and that is between thirty and forty years ago—great show ring buckjumpers like Snips, Queensland, and Carrandotta, and many others, have earned wide reputations for the number of first-rate riders each has thrown. Old timers will, of course, argue that "horses don't buck like they used to," but something outstanding is always turning up that can "screw buck" just as fiercely and for as long a time as anything ever foaled. And no matter how good a buckjumper may be, someone will always be found to master it—even though many reputations may become tarnished in the attempt. Horses like Dargan's Grey, which earned their reputation in the ring could, and would, have been ridden to a standstill under ordinary station conditions. In fact, we have seen some of the toughest of young-uns tamed when horses were being selected for a mustering outfit. Someone will always be found to master the wildest outlaw. But, of course, horses would not be buckjumpers if they didn't have a victory now and then.

Roughriders may come and go, but we don't suppose there has ever been many better riders than "Boomerang" Jack Brady. From Bourke through Western Queensland to Wyndham, in North-western Australia, he was known wherever cattle were mustered. Riding a bad horse was, to him, like having breakfast. With perfect hands he would measure up to our idea of a finished, balanced rough rider. The reputed outlaws "Boomerang" Brady mastered were legion, but it was when on a young colt that he showed his best ability, his light hands and perfect balance making his riding a sheer delight to watch. It is doubted if he was ever thrown in a fair go. Many a drover and old admirer recall his exploits when they read of the breaking-in of Light Horse and Artillery remounts for war service these days out at Enoggera or wherever the horses for the new A.I.F. are broken in.

Farm Notes

JANUARY.

THE heaviest rains of the year occur usually during the January-March period, and, weather conditions permitting, the main field activity for the month will be the preparation of land for autumn and winter crops, together with the scarifying and chipping required for existing row crops.

In all districts where wheat, barley, canary seed, and oats have been harvested, ploughing should be continued in order to conserve moisture for the succeeding crop, and to eradicate troublesome summer weeds.

Early ploughing permits the accumulation of subsoil moisture, which is invaluable in promoting the growth of winter cereals at a time when seasonal rainfall is often deficient. The practice of early ploughing is recommended, especially to dairymen outside the wheat areas who normally sow oats, barley, and wheat for green feed.

Land intended for the February potato planting will now be in an advanced stage of preparation. The selection of whole seed from disease-free crops is recommended for autumn planting, as losses may occur from rotting if hot, wet conditions prevail after the planting of cut sets. Very small whole potatoes, less than 2 inches in diameter, are not likely to give the same results as more robust potatoes.

Succession sowings of summer fodder crops—such as sorghum (saccaline, white African, and imphee), Sudan grass, white panicum, Japanese millet, and cowpea may be continued where land is available. Maize sowing may also be completed in districts where early frosts are not the usual experience, but preference should be given to early-maturing or mid-season varieties.

Full advantage should be taken of the opportunity to arrange for the adequate conservation of fodder during the summer growing season, when the production of bulky, green crops presents no great difficulty.

Well-grown crops of maize and the sweet sorghums cut at the right stage of growth and before full maturity will make excellent silage which may be economically conserved in pit, trench, stack, or overhead silo. Surplus green grass, and many other green crops also, will make satisfactory silage for winter feed, and as a reserve for dry periods. Many dairymen prefer to rely on a continuity of green fodder crops throughout the year, but provision also should be made for conservation, for if pastures are scarce because of dry conditions, crop growth is then also at a minimum.

January is usually a favourable month for the sowing of paspalum, Rhodes, and other summer grasses in districts suitable for their growth. Recently burnt scrub land or thoroughly cultivated areas provide a good seed-bed, given sufficient moisture, but care should be taken to ensure that the germination standard of the seed is sufficiently high, as a good cover and rapid early growth is the principal factor in keeping weeds and undergrowth in check.

All harvesting machinery should be placed under cover. Repairs and adjustments may be regarded as wet-day jobs.

DISTILLED WISDOM.

Blessed is he who has found his work; let him ask no other blessedness. He has a work, a life purpose; he has found it, and will follow it!—*Thomas Carlyle.*

Don't do anything till you do it, and when you've done it, stop doing it.—*William Gillette.*

Noah was six hundred years old before he knew how to build an ark—don't lose your grip.—*Elbert Hubbard.*

When the outlook is not good, try the uplook.

Orchard Notes

JANUARY.

THE COASTAL DISTRICTS.

ORCHARDS and plantations should now be carrying a good cover crop, which will help to check erosion during the wet season and, when cut and turned under, maintain the soil in good physical condition.

Pineapple plantations should be kept well worked.

Bananas and pineapples may still be planted, although it is somewhat late for the former in the southern parts of the State. It would be wise to keep a good lookout for pests of all kinds, including Maori on citrus trees, scale insects, leaf-eating insects, borers, and fungus pests generally, using the remedies recommended by the Department of Agriculture and Stock.

Care is advised in handling and marketing of all kinds of fruit.

Grapes are in full season, and in order that they may be sold to advantage they should be very carefully handled, graded, and packed, as their value depends on the condition in which they reach the market. Well-coloured, mature fruit, with the bloom on and without blemish, always sells well. One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe. A maturity standard for grapes is now in force, and immature grapes are liable to condemnation.

Bananas for the interstate trade should be well filled, but showing no sign of ripening. The fruit should be carefully graded and packed and the cases marked in accordance with the prescribed regulations and despatched without delay.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

JANUARY is a busy month in the Stanthorpe district, and orchardists will be fully occupied gathering, packing, and marketing the crop of mid-season fruits.

Much of the fruit may not carry far beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good firm apples should stand the journey to the Central District; and, if they are carefully selected and properly graded and packed, they should carry as far as Cairns.

Points to remember:—

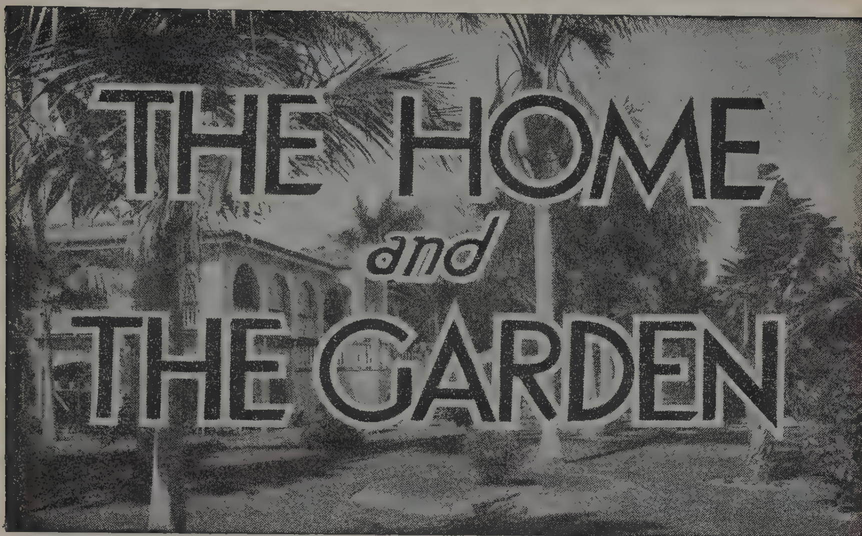
The fruit should be fully developed, but quite firm when gathered.
It should be handled carefully. Bruised fruit is spoilt fruit.

Only one-sized fruit, of an even degree of ripeness and colour, should be packed in a case.

The fruit should be so packed that it will not shift, for if it is packed loosely it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

OVERDOING A JOB.

There's such a thing as carrying an idea too far. The story is told of a farmer so keen on cleanliness about his place that he painted the inside of his concrete silo. The fermenting ensilage dissolved the ingredients in the paint and contaminated the fodder with lead. When a few of his cows died mysteriously he started to investigate. Lead poisoning was the cause, and it was traced to its source—the painted interior walls of his concrete silo. He is not likely to forget the moral of the lesson he got through being TOO fussy.



Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

THE NEWLY BORN BABY.

Health of Mother and Child.

THE health of the baby at birth is closely related to the health of the mother during pregnancy. There are expectant mothers who, because they have had one or two babies without any trouble, are apt to become careless or indifferent regarding the care and supervision of their health. They overlook or are not aware of the fact that the supervision which is recommended and provided for all mothers is necessary not only in their own interest and that of their family, but also in the interest of the expected baby. A large number of babies are born prematurely or in such a debilitated state that many of them are unable to survive the first week. Of every 100 children who die during the first year of life, about sixty-seven die during the first month, and of these most die during the first week. Maternity hospitals and wards have been built throughout the State by the Government, and in connection with these supervision and care are provided for expectant mothers. No mother should neglect to take full advantage of this service which is offered. From the statistics of one large hospital it is learned that of the women admitted to the hospital who had not received adequate supervision and care during pregnancy, almost one-third of them developed some disease associated with pregnancy or child-birth, and that the mothers of nearly one-sixth of the infants born prematurely had suffered from such disease.

Notification.

The maternal and child welfare nurse is able to call upon the mother of the newly-born child of whose birth she receives notification. The case is different in regard to the expectant mother, upon whose co-operation in making her condition known to them, the doctor and nurse are entirely dependent.

The Nature of the Supervision.

What is the nature of this supervision or ante-natal care, some may ask. Actual treatment advised is very little, and the advice given, generally speaking, aims at preventing disease, discomfit, and pain. Many women remain fit and well during pregnancy, but it is important that the expectant mother should receive advice during the early months of pregnancy in order that she may learn how to keep herself fit, and may know what she may safely do. It will give her peace of mind and confidence to feel that someone who understands is guiding her. The mother will be doing the best for herself and for her unborn infant if she follows the advice she receives and reports regularly to the doctor or nurse. While the supervision is in their hands, the hygiene of pregnancy is in the hands of the mother herself.

Diet.

It is most important that the expectant mother should eat food of the right kind. The baby is entirely dependent on her for his nourishment during the nine months before he is born.

Three meals a day are sufficient, and should include milk, egg, cheese, butter, meat, vegetables, fruit, and bread, as follows:—

Milk.—1¼ to 2 pints. In districts where cow's milk cannot be obtained, use goat's milk, if possible. If fresh milk cannot be procured, use full cream dried milk. Some of the milk will be taken with porridge, some in junket or milk puddings.

Egg.—One.

Cheese.—1 oz.

Butter.—1½ to 2 oz. If there is a deficiency of butter, fresh beef dripping may be used.

Meat should be taken in moderation, and should include liver and fish. Tinned salmon and herring are valuable.

Vegetables, both raw and cooked, should be eaten. Raw vegetables eaten as salads should include lettuce, tomatoes, celery, scraped carrot, finely-cut raw cabbage, and sweet peppers. These can be grown in most gardens. Potatoes should be cooked in their own jackets and eaten every day. Other wholesome vegetables are spinach, silver beet, Chinese cabbage, French beans, peas, turnip tops, swede turnip, pumpkin, and sweet potatoes.

Fruit should always be eaten and is best uncooked. Tomatoes, oranges, papaws, pineapples, bananas, and mangoes are wholesome, but all fruit is good when taken in reasonable quantities. Canned fruit should be used when fresh fruit cannot be obtained.

Bread and scones should be made of wholemeal.

A liberal supply of water should be taken between meals.

In addition to the right kind of food, the expectant mother needs fresh air and sunshine, and of these there is no shortage in Queensland. She should have adequate sleep in addition to exercise, and recreation stopping short of fatigue.

If they experience any difficulty in receiving advice, expectant mothers are invited to write to the nearest Maternal and Child Welfare Centre (Baby Clinic) or to the Maternal and Child Welfare Training Centre, Alfred street, Fortitude Valley, Brisbane.

IN THE FARM KITCHEN.

CHRISTMAS PUDDINGS.

FOR those who like a Christmas pudding, but at the same time prefer a cold pudding, a recipe for frozen plum pudding is included.

Take 4 oz. suet, $\frac{1}{2}$ lb. seeded raisins, $\frac{1}{4}$ lb. currants, 2 oz. sultanas, 2 oz. candied peel, 1 oz. shelled walnuts, 4 oz. sugar, 3 oz. breadcrumbs, $1\frac{1}{2}$ oz. flour, grating of nutmeg, $\frac{1}{4}$ flat teaspoonful ground cinnamon, $\frac{1}{4}$ flat teaspoonful ground cloves, 2 eggs, $\frac{1}{2}$ gill rum.

Wash, pick over, and dry the fruits, and stone the raisins. Shred the candied peel and chop up the walnuts. Sieve the flour with the spices, add the finely-chopped suet and the breadcrumbs, then stir in the sugar, prepared fruits and nuts, and mix all together. Whisk the eggs and add them. Moisten the mixture with the rum and some milk as required. Beat it well and leave it to stand overnight, adding more moisture after that time if necessary. Turn the mixture into six buttered moulds. Cover them securely with buttered papers, and steam them for about an hour and a half to two hours. Unmould the puddings and serve them with half a shelled walnut on each. Sufficient for six persons.

Christmas Pudding.

Take $\frac{1}{2}$ lb. breadcrumbs, $\frac{1}{2}$ lb. seeded raisins, 1 oz. citron peel, 1 grated carrot, $\frac{1}{2}$ lb. brown sugar, $\frac{1}{2}$ lb. muscatel raisins, 6 oz. flour, $1\frac{1}{2}$ gills ale, $\frac{1}{2}$ lb. shredded suet, 2 oz. lemon peel, 6 eggs, 2 nutmegs, $\frac{1}{2}$ lb. currants, $\frac{1}{4}$ lb. orange peel, 3 oz. almonds, salt.

Mix the breadcrumbs, sugar, grated nutmeg, chopped raisins, cleaned currants, minced peels, and a pinch of salt together in a basin. Stir in suet, then the minced blanched almonds. Add well-beaten eggs and remaining ingredients, without the ale. Beat for two or three minutes with a wooden spoon, then stir in the ale. Cover and leave for several days, stirring once daily. Pack into two buttered pudding basins if small puddings are wanted or into one large pudding basin if a pudding for twelve is wanted. Cover with buttered paper and then a floured cloth. Steam for seven or eight hours in a saucepan with boiling water, coming half-way up the sides. If two puddings are made of the mixture, four or five hours is long enough to cook. Cook either the small puddings or the large pudding for four hours on Christmas Day, then turn out, sprinkle with vanilla sugar, decorate with a sprig of holly, and serve with brandy or rum custard.

Old English Plum Pudding.

Take $\frac{3}{4}$ cupful sifted flour, $1\frac{1}{2}$ teaspoonfuls salt, $\frac{1}{2}$ nutmeg (grated), $\frac{1}{4}$ teaspoonful cinnamon, $\frac{1}{3}$ teaspoonful of mace, 1 teaspoonful ground cloves, $\frac{1}{2}$ lb. seeded raisins, $\frac{1}{4}$ lb. currants, $\frac{1}{4}$ lb. chopped figs, 2 oz. citron (chopped), 2 oz. candied orange peel (chopped), $\frac{1}{2}$ cupful breadcrumbs, 1 cupful hot milk, 4 eggs (separated), $\frac{1}{2}$ lb. good beef suet (finely chopped), $\frac{1}{2}$ cupful boiled cider.

Mix and sift flour, salt, and spices. Stir in fruits. Soak crumbs in hot milk for ten minutes. Beat sugar into well-beaten egg-yolks, and add suet and soaked crumbs; stir into flour mixture. Add cider and mix well. Fold in stiffly-beaten egg-whites. Turn into greased one and a-half quart mould or basin, cover and steam three and a-half hours. Approximate yield: twelve portions.

Georgia Christmas Pudding.

Take ½ cupful chopped walnuts or pecan nuts, ½ cupful sugar, 6 egg-whites, ½ cupful chopped raisins, ½ cupful sherry, ¼ cupful rum, 1 teaspoonful lemon juice.

Soak the nuts and raisins in the lemon juice for at least six hours—overnight if possible. Beat the egg-whites to a very stiff froth, add the sugar and beat till ropy. Fold in the wine-soaked fruits and nuts. Pour into a buttered baking dish. Set in a pan of hot water. Bake in a moderate oven for one hour. Serve with the following sauce: Make a custard of 6 egg-yolks, ¼ cupful of sugar, and 1½ cupfuls scalded milk. When smoothly thickened, flavour with sherry and serve on the Christmas pudding. This is a famous old Georgia recipe.

Frozen Plum Pudding.

Take ¼ cupful currants, ¼ cupful seeded raisins, ¼ cupful finely-shredded citron, 12 maraschino cherries, 3 tablespoonfuls shredded dates, 3 tablespoonfuls shredded figs, ½ cupful maraschino cordial, 3 tablespoonfuls blanched, chopped almonds, 1 quart chocolate ice cream.

Wash currants, add raisins, and steam or simmer in a small amount of water for five minutes, or until plump; drain and cool. Marinate all other fruits in maraschino cordial for six hours; combine fruits and nuts, and mix it into ice cream. Turn into freezing trays of refrigerator and freeze for two to four hours or until firm.

Hard Times Christmas Pudding.

Take ¼ lb. flour, ¼ lb. breadcrumbs, 1 cupful milk, ½ lb. stoned dates, ½ teaspoonful salt, ¼ lb. currants, 3 oz. shredded suet, 1 apple, 2 tablespoonfuls treacle, ½ teaspoonful mixed spice.

Mix flour and crumbs together in a basin. Chop apple and suet. Quarter dates and add with apple and sugar, suet, currants, spices, and salt to flour, and crumbs. Warm treacle. Add to milk and stir in dry ingredients. Turn into a well-greased basin. Cover with a greased paper and steam for six hours. Turn out and serve with custard sauce.

Nursery Christmas Pudding.

Take 1 oz. ground rice, 6 oz. breadcrumbs, 3 oz. raisins, 4 oz. suet, 2 oz. sugar, 3 eggs, 2 tablespoonfuls plum jam, milk, butter, 1 teaspoonful baking-powder.

Mix together all the dry ingredients except the raisins. Stir in the jam, add the beaten eggs, finely-chopped suet, and a little milk. Butter a mould, seed the raisins, and stick them in even rows in the mould. Pour the pudding in very gently and cover with greased paper. Steam for two hours. Turn out and serve with custard sauce.

Special Diet Christmas Pudding.

Take 8 oz. coconut meal, 16 prunes (soaked and minced), 1 lb. seeded muscats (minced), 4 oz. raisins (2 oz. left whole and 2 oz. chopped), 2 beaten egg-yolks, 4 oz. chopped walnuts and almonds (mixed), a very little grated orange and lemon rind, 3 dessertspoonfuls whisky (or more as desired).

Mix all the ingredients together thoroughly. Add a little prune juice if mixture seems too dry, but mixture should be fairly stiff. This amount is sufficient for two medium-sized puddings. Steam in buttered basins for one hour. If liked, a teacupful of grated carrot can be added to this mixture. For a sweeter pudding, omit prunes.

WHEN THE CHICKEN WON'T GET THE AXE.

Electrocution of poultry is a possibility of the future. A Canadian man of science has been experimenting quite successfully with the slaughter of fowls by electricity. The electric current also relaxes the muscles and so makes the removal of the feathers a very easy job.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF OCTOBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1939 AND 1938, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of years' records.	Oct., 1939.	Oct., 1938.
North Coast.	In.		In.	In.
Atherton	0·94	38	1·26	1·77
Cairns	2·14	57	1·10	4·30
Cardwell	2·01	67	2·16	1·38
Cooktown ..	1·03	63	0·24	1·38
Herberton ..	0·97	53	0·90	1·10
Ingham	1·86	47	1·55	1·97
Innisfail	3·26	58	0·78	5·31
Mossman Mill ..	2·93	26	5·52	3·49
Townsville ..	1·31	68	0·02	0·75
Central Coast.				
Ayr	0·92	52	0·15	1·37
Bowen	1·01	68	0·04	0·92
Charters Towers ..	0·74	57	0·18	1·77
Mackay P.O. ..	1·73	68	1·47	2·43
Mackay Sugar Experiment Station	1·48	42	..	2·06
Proserpine ..	1·62	36	0·72	1·84
St. Lawrence ..	1·79	68	2·10	1·41
South Coast.				
Biggenden ..	2·46	40	5·65	2·35
Bundaberg ..	2·13	56	2·10	2·99
Brisbane	2·56	87	2·31	3·45
Caboolture ..	2·63	52	2·40	4·61
Childers	2·76	44	3·74	2·66
Crohamhurst ...	3·38	46	3·94	6·85
Esk	2·64	52	2·66	2·60

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of years' records.	Oct., 1939.	Oct., 1938.
South Coast—contd.	In.		In.	In.
Gatton College ..	2·06	40	1·71	2·59
Gayndah	2·42	68	1·78	3·10
Gympie	2·74	69	1·87	3·12
Kilkivan	2·68	60	3·64	4·50
Maryborough ..	2·76	68	2·90	4·25
Nambour	3·23	43	3·05	4·18
Nanango	2·26	57	1·03	2·96
Rockhampton ..	1·80	68	2·28	3·36
Woodford ..	2·62	52	1·63	1·91
Central Highlands.				
Clermont ..	1·31	68	1·45	1·80
Gindie	1·38	40	..	1·62
Springsure ..	1·65	70	1·20	2·65
Darling Downs.				
Dalby	2·06	69	0·60	2·42
Emu Vale ..	2·20	43	1·18	2·79
Hermitage ..	1·92	33	..	3·26
Jimbour	1·88	51	0·45	2·72
Miles	2·06	54	0·33	4·14
Stanthorpe ..	2·52	66	1·29	2·15
Toowoomba ..	2·58	67	0·98	3·06
Warwick	2·34	74	1·04	4·26
Maranoa.				
Bungeworgorai ..	1·44	25	..	0·72
Roma	1·75	65	0·75	1·85

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—OCTOBER, 1939.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·98	83	70	86	23	57	6	24	2
Herberton	..	80	56	88	17	42	1	90	6
Rockhampton	30·07	82	62	89	6, 16	55	11	228	10
Brisbane	30·12	75	58	82	16	52	8	231	9
Darling Downs.									
Dalby	30·10	80	52	88	15, 16	39	8, 11	60	5
Stanthorpe	..	71	46	81	15	28	10	129	9
Toowoomba	..	75	50	88	7	34	10	98	10
Mid-Interior.									
Georgetown	29·96	93	65	98	6, 17	44	1	110	5
Longreach	30·00	88	60	98	4, 16	45	11	413	7
Mitchell	30·05	81	53	92	15	35	11	50	3
Western.									
Burketown	29·96	90	67	98	8, 25	57	12	55	2
Boulia	29·99	88	61	104	5	46	11	144	3
Thargomindah ..	30·02	82	58	104	5	43	10	126	6

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	December, 1939.		January, 1940.		MOONRISE. Dec., 1939.	MOONRISE. Jan., 1940.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	4·50	6·31	5·0	6·50	10·17	11·9
2	4·50	6·30	5·1	6·50	11·1	11·50
3	4·50	6·30	5·1	6·50	11·45	a.m.
4	4·50	6·33	5·2	6·51	..	12·31
					a.m.	
5	4·50	6·34	5·3	6·51	12·27	1·15
6	4·50	6·34	5·3	6·51	1·8	2·2
7	4·51	6·35	5·4	6·51	1·49	2·51
8	4·51	6·36	5·5	6·52	2·33	3·43
9	4·51	6·37	5·5	6·52	3·19	4·37
10	4·51	6·38	5·6	6·52	4·7	5·41
11	4·51	6·38	5·7	6·52	4·59	6·26
12	4·52	6·39	5·8	6·51	5·52	7·17
13	4·52	6·40	5·9	6·51	6·45	8·9
14	4·52	6·40	5·10	6·51	7·41	9·2
15	4·52	6·41	5·11	6·51	8·34	9·47
16	4·53	6·41	5·12	6·50	9·27	10·37
17	4·53	6·42	5·13	6·50	10·17	11·31
						p.m.
18	4·53	6·42	5·13	6·50	11·8	12·26
19	4·54	6·43	5·14	6·50	11·58	1·18
					p.m.	
20	4·54	6·44	5·15	6·49	12·49	2·14
21	4·54	6·44	5·16	6·49	1·41	3·11
22	4·55	6·45	5·17	6·49	2·35	3·45
23	4·55	6·45	5·18	6·48	3·32	5·2
24	4·56	6·46	5·19	6·48	4·29	5·56
25	4·56	6·47	5·19	6·48	5·27	6·49
26	4·56	6·47	5·20	6·47	6·25	7·36
27	4·57	6·48	5·21	6·47	7·19	8·23
28	4·58	6·48	5·22	6·47	8·11	9·6
29	4·58	6·49	5·23	6·46	8·59	9·49
30	4·59	6·49	5·24	6·46	9·44	10·30
31	5·0	6·50	5·25	6·46	10·26	11·18

Phases of the Moon, Occultations, &c.

4th Dec.	☾ Last Quarter	6 40 a.m.
11th ,,	● New Moon	7 45 a.m.
19th ,,	☽ First Quarter	7 4 a.m.
26th ,,	○ Full Moon	9 28 p.m.

Perigee, 3rd December, at 5.0 p.m.
Apogee, 18th December, at 2.0 a.m.
Perigee, 29th December, at 9.0 p.m.

Mercury rises at 4.32 a.m., 18 min. before the Sun, and sets at 6.7 p.m., 24 min. before it on the 1st; on the 15th it rises at 3.34 a.m., 1 hr. 18 min. before the Sun, and sets at 6.1 p.m., 40 min. before it.

Venus rises at 6.19 a.m., 1 hr. 29 min. after the Sun, and sets at 8.12 p.m., 1 hr. 41 min. after it on the 1st; on the 15th it rises at 6.40 a.m., 2 hrs. 48 min. after the Sun, and sets at 8.31 p.m., 1 hr. 50 min. after it.

Mars rises at 11.31 a.m. on the 1st, and sets at 12.18 a.m. on the 2nd; on the 15th it rises 11.15 a.m. and sets at 11.50 a.m. on the 16th.

Jupiter rises at 1.8 p.m. on the 1st, and sets at 1.23 a.m. on the 2nd; on the 15th it rises at 12.16 p.m. and sets at 12.27 a.m. on the 16th.

Saturn rises at 3.7 p.m. on the 1st, and sets at 2.40 a.m. on the 2nd; on the 15th it rises at 2.7 p.m. and sets at 1.44 a.m. on the 16th.

During this month four of the five visible planets will be above our horizon: Venus, Mars, Jupiter, and Saturn.

At our Summer Salstice on 23rd December the Sun will reach its furthest limit, 23½ deg. south of the Celestial equator, and all places within that latitude will have the Sun directly overhead at midday, and men and telegraph poles will be without a shadow. Not for long, fortunately for men. When Peter Schlemihl in an unhappy hour had sold his shadow, he left, at his end, to his friend Chamissa, his curious story with the advice: "If thou wouldst live among men then learn above all things to respect thy shadow, and after that thy money. If thou wouldst live for thy better self, O friend, thou wilt need no advice."

At Christmas-time our sky is rich in luminous constellations in and around the Milky Way. Among them Orion is the most conspicuous. The three stars in its belt are called in Scandinavia "de tre visa mannen" (the three wise men) and these point to Sirius, the greatest and most beautiful star in the heavens.

2nd Jan.	☾ Last Quarter	2 56 p.m.
9th ,,	● New Moon	11 53 p.m.
18th ,,	☽ First Quarter	4 21 a.m.
25th ,,	○ Full Moon	9 22 a.m.

Apogee, 14th January, at 10 p.m.
Perigee, 26th January, at 9 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.